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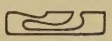

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The Ants of the Baltic Amber.

By

William Morton Wheeler Ph. D.

Professor of Economic Entomology, Harvard University.

Seven years ago the late Professor Richard Klebs of Königsberg requested me to study and describe the ants in his beautiful collection of amber inclusions, and, on my consenting, forthwith sent me all of his specimens, 1405 in number. A year later Professor A. Tornquist generously sent me the entire Formicid collection of the Königliche Bernsteinsammlung des Geologischen Instituts of Königsberg. This remarkable collection comprises 7819 specimens, exclusive of Gustav Mayr's types, which were also loaned me for reëxamination. In addition to this material I have been able to study three smaller collections. Monsieur G. Severin loaned me the collection of the Brussels Museum, comprising 19 specimens, Dr. Richard Heymons that of the Berlin Museum, comprising 115, and Mr. William Haren of St. Louis, Missouri, his private collection of 169 specimens. Thus I have been able to study altogether 9527 ants from the Baltic amber. I wish to express my indebtedness to all these gentlemen for the loan of so many specimens, and, especially to Prof. Tornquist for permission to retain so much valuable material in my possession for several years. I sincerely regret that the work has been so unduly protracted and so frequently interrupted by urgent professional duties. This regret is the deeper, because Prof. Klebs, who first interested me in the subject and gave me much friendly assistance in the early part of the work, did not live to see it completed.

As many previous students have remarked, the study of the insects embedded in the amber is frought with many and peculiar difficulties. Although some specimens are as beautifully clear as if they had just been carefully dehydrated and embedded in Canada balsam by an expert histologist, most of the specimens are either in awkward positions or have portions of the body concealed beneath milky or silvery films or air-bubbles or obscured by disconcerting cracks, or the highly refractive medium gives rise to distorted images which can be corrected only by repeated examination in the most various lights or by careful comparison of numerous specimens of the same species. It is, of course, possible to dissolve the amber away

from the insects, but when this is done, only a black, crumbling, residue of decomposed chitin remains. At least this was all I saw of the few common specimens which I attempted to free from their matrix. KORNILOWITSCH[1]) in a paper cited by KLEBS, seems to have shown that even the fine histological details of the leg musculature may be preserved in Diptera and Neuroptera, but I have never observed such details in the ants *in situ*, although the chitin of their legs is often very transparent.

All the little blocks of amber containing the specimens belonging to the various collections had been carefully cut and polished, and, in many instances, enclosed in cells full of Canada balsam and mounted on slides, to preserve them from the slow darkening in color and partial opacity, which the originally very transparent, pale yellow amber is liable to take on when long exposed to the air. This change is, unfortunately, very noticeable in MAYR's types, which were simply glued to slides and are now much darker and more obscure than they could have been when the distinguished myrmecologist described them nearly half a century ago. All the specimens in the KLEBS, Brussels, Berlin and HAREN Collections and most of those in the Königsberg Collection are carefully numbered. Except in cases where there are very many specimens of the same species, I have taken pains to cite all these numbers, so that my types and often also a long series of cotypes may be readily recognized by any future investigator.

MAYR's work on the ants of the Baltic amber published in 1868[2]) is such a thorough and comprehensive masterpiece that even the much larger amount of material which has since accumulated, necessitates comparatively few changes. That this work has enormously facilitated my study, goes without saying. As his species are all easily recognizable from his descriptions and figures, notwithstanding the somewhat diagrammatic character of the latter, I have deemed it unnecessary to repeat his tables or to rewrite the majority of his diagnoses and the history of the older literature of the subject. Since 1868 very little attention has been devoted to the amber ants. EMERY[3]) and ERN. ANDRÉ[4]) have described a few species, and the former has mono-

[1]) Hat sich die Struktur der quergestreiften Muskeln im fossilen Bernstein erhalten? Sitzb. Naturf. Gesell. Dorpat, XIII, 1903, pp. 198—203.

[2]) Die Ameisen des baltischen Bernsteins. Beiträge zur Naturkunde Preußens, herausgegeben v. d. physik.-ökonomischen Gesellschaft zu Königsberg, I, 1868, 102 pp. 5 pls.

[3]) Deux Fourmis de l'Ambre de la Baltique. Bull. Soc. Ent. France, 1905, pp. 187—189, 2 Figs.

[4]) Notice sur les fourmis fossiles de l'ambre de la Baltique et description de deux espèces nouvelles. Bull. Soc. Zool. France XX, 1895, pp. 80—84.

graphed the ants of the Sicilian amber[1]), which is, however, of later, Miocene, age and comprises a different fauna, with few genera and no species common to the Baltic fauna.

From his study of 1461 specimens, MAYR described 49 species, referable to 23 genera. EMERY added a single genus and species, *Dimorphomyrmex theryi,* and ANDRÉ two species, *Plagiolepis succini* and *Vollenhovia prisca*, attributing the latter to *Macromischa* ROGER, a neotropical genus which had been adopted by MAYR for several Baltic species. To this list of 24 genera and 52 species I have added in the following pages 21 genera and 40 species. Allowing for certain necessary changes in the definition of genera, the list of ants from the Baltic amber, as it now stands, comprises 43 genera and 92 species. The genera all belong to four of the five sub-families to which all recent ants have been assigned, namely the *Ponerinæ, Myrmicinæ, Dolichoderinæ* and *Camponotinæ.* The following four tables give a list of the species and of the number of specimens of each which have passed through the hands of MAYR, ERN. ANDRÉ and myself. To these is appended a fifth table giving a summary of the four subfamilies

Table I.

Ponerinæ	Sexes Known			No. examined by MAYR	No. examined by ANDRÉ	No. examined by WHEELER	Total No. examined
Prionomyrmex longiceps MAYR	☿	—	♂	1	—	9	10
Procerapachys annosus WHEELER	☿	—	♂	—	—	8	8
Procerapachys favosus WHEELER	☿	—	—	—	—	1	1
Bradoponera meieri MAYR	☿	♀	—	5	2	11	18
Ectatomma (Rhytidoponera) europæum MAYR	—	♀	♂	1	—	3	4
Electroponera dubia WHEELER	☿	—	—	—	—	1	1
Platythyrea primæva WHEELER	☿	♀	—	—	—	2	2
Euponera (Trachymesopus) succinea (MAYR) .	—	♀	—	3	—	21	24
Ponera atavia MAYR	☿	♀	♂	13	—	29	42
? Ponera gracilicornis MAYR	☿	—	—	1	—	—	1
Total				24	2	85	111

[1]) Le Formiche dell'ambra siciliana nel museo mineralogico dell'Università di Bologna. Mem. R. Acc. Sc. Ist. Bologna (5) I, 1891, pp. 141–165, 3 pls.

Table II.

Myrmicinæ	Sexes Known			No. examined by MAYR	No. examined by ANDRÉ	No. examined by WHEELER	Total No. examined
Sima klebsi WHEELER	☿☿☿

Table III.

Dolichoderinæ	Sexes Known			No. examined by MAYR	No. examined by ANDRÉ	No. examined by WHEELER	Total No. examined
Protaneuretus succineus WHEELER	♀	♀	—	—	—	5	5
Paraneuretus tornquisti WHEELER	♀	—	♂	—	—	24	24
Paraneuretus longipennis WHEELER	—	—	♂	—	—	1	1
Dolichoderus (Hypoclinea) cornutus MAYR	♀	—	—	9	3	16	28
Dolichoderus (Hypoclinea) balticus MAYR	♀	♀	♂	11	1	18	30
Dolichoderus (Hypoclinea) passalomma WHEELER	♀	—	—	—	—	10	10
Dolichoderus (Hypoclinea) elegans WHEELER	♀	—	—	—	—	1	1
Dolichoderus (Hypoclinea) mesosternalis WHEELER	♀	—	—	—	—	5	5
Dolichoderus (Hypoclinea) vexillarius WHEELER	♀	—	—	—	—	6	6
Dolichoderus (Hypoclinea) sculpturatus MAYR	♀	—	—	2	4	13	19
Dolichoderus (Hypoclinea) tertiarius MAYR	♀	♀	♂	87	38	369	494
Dolichoderus (Hypoclinea) longipennis MAYR	—	—	♂	2	—	—	2
Iridomyrmex geinitzi (MAYR)	♀	♀	♂	168	80	1041	1289
Iridomyrmex constrictus (MAYR)	☿	—	♂	10	3	57	70
Iridomyrmex goepperti (MAYR)	♀	♀	♂	589	309	4539	5428
Iridomyrmex samlandicus WHEELER	♀	—	—	—	—	82	82
Iridomyrmex oblongiceps WHEELER	☿	—	—	—	—	1	1
Liometopum oligocenicum WHEELER	♀	—	—	—	—	2	2
Asymphylomyrmex balticus WHEELER	☿	—	—	—	—	10	10
Pityomyrmex tornquisti WHEELER	♀	—	—	—	—	1	1
Total				869	438	6201	7508

Table IV.

Camponotinæ	Sexes Known			No. examined by MAYR	No. examined by ANDRÉ	No. examined by WHEELER	Total No. examined
Plagiolepis succini ERN. ANDRÉ	☿	—	—	—	1	—	1
Plagiolepis klinsmanni MAYR	☿	—	♂	8	3	85	96
Plagiolepis kuenowi MAYR	☿	—	—	1	2	10	13
Plagiolepis squamifera MAYR	☿	—	—	2	—	4	6
Plagiolepis singularis MAYR	—	♀	—	1	—	—	1
Plagiolepis solitaria MAYR	—	—	♂	1	—	—	1
Rhopalomyrmex pygmæus MAYR	☿	—	♂	1	1	12	14
Dimorphomyrmex theryi EMERY	☿	—	—	—	—	36	36
Dimorphomyrmex mayri WHEELER	☿	—	—	—	—	1	1
Gesomyrmex annectens WHEELER	☿	—	—	—	—	23	23
Gesomyrmex hœrnesi MAYR	☿	—	♂	19	7	112	138
Prodimorphomyrmex primigenius WHEELER	☿	—	—	—	—	1	1
Œcophylla brischkei MAYR	☿	—	♂	5	—	45	50
Œcophylla brevinodis WHEELER	☿	—	—	—	—	1	1
Prenolepis henschei MAYR	☿	♀	♂	69	18	524	611
Prenolepis pygmæa MAYR	—	♀	♂	23	1	49	73
Lasius schiefferdeckeri MAYR	☿	♀	♂	174	96	902	1172
Lasius pumilus MAYR	☿	—	—	3	1	67	71
Lasius punctulatus MAYR	—	♀	—	4	—	8	12
Lasius nemorivagus WHEELER	—	♀	—	—	—	1	1
Lasius edentatus MAYR	—	—	♂	1	—	—	1
Formica flori MAYR	☿	♀	♂	189	99	1022	1310
Formica horrida WHEELER	☿	—	—	—	—	2	2
Formica phaëthusa WHEELER	☿	—	—	—	—	2	2
Formica clymene WHEELER	☿	—	—	—	—	1	1
Formica constricta (MAYR)	☿	—	—	5	2	12	19
Formica strangulata WHEELER	☿	—	—	—	—	2	2
Glaphyromyrmex oligocenicus WHEELER	☿	—	—	—	—	1	1
Pseudolasius boreus WHEELER	☿	—	—	—	—	33	33
Dryomyrmex fuscipennis WHEELER	—	♀	—	—	—	4	4
Dryomyrmex claripennis WHEELER	—	♀	—	—	—	1	1
Camponotus mengei MAYR	☿	—	♂	12	12	105	129
Total				518	243	3066	3827

Table V.

Subfamilies	No. of genera	No. of species	No. of specimens examined by MAYR	No. of specimens examined by ANDRÉ	No. of specimens examined by WHEELER	Total No. of specimens examined
Ponerinæ	8	10	24	2	85	111
Myrmicinæ	15	30	50	7	175	232
Dolichoderinæ	7	20	869	438	6201	7508
Camponotinæ	13	32	518	243	3066	3827
Total	43	92	1461	690	9527	11678

If we reduce the numbers of the genera, species and individuals of the last table to percentages we have the following:

	Genera	Species	Individuals
Ponerinæ	18,6%	10,8%	0,9%
Myrmicinæ	34,6%	32,6%	2,1%
Dolichoderinæ	16,2%	21,7%	64,2%
Camponotinæ	30,2%	34,7%	32,7%

In other words, although less than 1% of the individual ants are *Ponerinæ,* they represent more than $^1/_{10}$ of the species and nearly $^1/_5$ of the genera. And while the Myrmicinæ genera constitute a little more than $^1/_3$ of the total number, and the species a little less than $^1/_3$, the number of individuals is only a little more than 2%. Very different is the condition in the *Dolichoderinæ,* which embrace only about $^1/_6$ of the genera and $^1/_5$ of the species, but nearly $^2/_3$ of all the individuals. The *Camponotinæ*, finally, are not far from constituting $^1/_3$ of all the genera, species and individuals. While the proportional representation of species of the different subfamilies would, I believe, not be very different in the recent ant fauna of many tropical or subtropical regions as large as that in which the Baltic amber was formed, the individual representation would be very different, for the *Ponerinæ* would be more abundant and the *Dolichoderinæ* much less abundant as compared with the *Myrmicinæ* and *Camponotinæ.*

The explanation of this singular condition is in part, at least, attributable to the selective action of the amber on the one hand and to the peculiarities of habit of the different subfamilies of ants on the other. It is well known that no large and powerful insects are preserved in the amber, for the obvious reason that vigorous orga-

nisms can not be readily trapped and overwhelmed by liquid resins. But this kind of selective action, has little bearing on our problem, unless we suppose what is not impossible, that large and powerful *Ponerinæ* and *Camponotinæ* — insects comparable to the Australian species of *Myrmecia,* the Brazilian species of *Paraponera* and *Dinoponera* or the Malayan *Camponotus gigas* — may have lived in the amber forests. The differences of habit, however, are certainly more important. The existing *Ponerinæ* are nearly all wary, terrestrial or even hypogæic ants, which rarely or never climb trees, but seek their insect prey on or under the surface of the ground, and there is every reason to believe that the early Tertiary species had the same habits. As EMERY maintains [1]), this would readily account for the small number of individuals of this subfamily in the material examined. The *Myrmicinæ,* too, are largely terrestrial, although several genera, such as *Sima, Monomorium, Leptothorax* and *Crematogaster* are very largely or entirely arboreal. *Sima* and *Leptothorax* are, in fact, represented by a fair number of species in the amber, though the number of individuals is scarcely as great as we should expect. *Crematogaster* is entirely wanting, though from its present cosmopolitan distribution we should certainly expect it to be present. The same is true of *Pheidole.* It would seem, therefore, that the absence of these and many other common Myrmicine genera, which in all probability existed as far back as the Lower Oligocene, must be due to their never having invaded the Baltic region rather than to the selective action of the liquid resin. The terrestrial habits of many other genera, such as *Erebomyrma, Stenamma, Aphænogaster, Myrmica* etc., sufficiently account for their small individual representation. Undoubtedly the preponderance of the *Dolichoderinæ* and *Camponotinæ,* which together constitute nearly 97 % of all the specimens, is due to the highly arboreal habits of these ants. The singular disproportion between the individual representations of these two subfamilies is brought about by two species of *Dolichoderinæ, Iridomyrmex gœpperti* and *I. geinitzi,* the former represented by 5428, the latter by 1289 specimens. If we subtract the sum of these (6717) from the total number of *Dolichoderinæ* (7508) we have left only 791 individuals, which is certainly much nearer the modern ratio of *Dolichoderinæ* to *Camponotinæ* in a tropical forest. The absence of one whole subfamily of ants, the *Dorylinæ,* from the Baltic amber, is still to be accounted for, since we can hardly suppose that this group, which is nearly as primitive as the *Ponerinæ,* was

[1]) Le Formiche dell'Ambra Siciliana, etc. loco citato p. 586.

not in existence during the early Tertiary. We must assume either that it was then as now confined to the tropics and immediately contiguous subtropical belt or that the eminently terrestrial or even hypogæic habits of its species excluded it from the amber. The former alternative seems to me to be much the more probable, because I have found specimens of recent *Dorylinæ (Anomma)* in the Zanzibar copal.

After this brief account of the subfamilies we may proceed to a comparison of the genera of the amber with those of recent ants. Of the 43 genera, 19 or 44,1 % are extinct and 24 or 55,8 % are still extant. The extant and extinct genera in the subfamilies *Ponerinæ, Myrmicinæ* and *Dolichoderinæ* are nearly equal in number, but of the *Camponotinæ* only 4 are extinct, while 9 have survived to the present time. This proportion of extinct to recent genera is not widely different from that found by Ulmer in his admirable study of a very different group of insects, the Trichoptera[1]), which are represented in the amber by 30 (53,5 %) extant and 26 (46,4 %) extinct genera. In the following list the names of the Formicid genera are followed by the number of known amber species in parentheses, and the extant genera are grouped according to the distribution of their recent species, the extinct genera with indications of their nearest affinities.

A. *Extant Genera.*

1. Cosmopolitan:

Ponera (2)	*Prenolepis* (2)
Aphænogaster (3)	*Camponotus* (1)

2. Tropicopolitan:

Platythyrea (1)	*Iridomyrmex* (5)
Euponera (Trachymesopus) (1)	*Dolichoderus (Hypoclinea)* (9)

3. Paleotropical:

Sima (5)	*Plagiolepis* (6)
Monomorium (2)	*Œcophylla* (2)

4. Indomalayan and Australian:

Ectatomma (Rhytidoponera) (1)	*Dimorphomyrmex* (2)
Vollenhovia (2)	*Pseudolasius* (1)
Gesomyrmex (2)	

5. Circumpolar:

Stenamma (1)	*Liometopum* (1)
Myrmica (1)	*Lasius* (5)
Leptothorax (5)	*Formica* (6)

[1]) Die Trichopteren des baltischen Bernsteins. Beiträge zur Naturkunde Preußens, herausgegeb. v. d. physik.-ökonom. Gesell. Königsberg. X, B. G. Teubner, Leipzig und Berlin, 1912, 380 pp., 480 text-figs.

6. Neotropical:
Erebomyrma (1)

B. ***Extinct Genera.***

1. Allied to paleotropical genera:
Prionomyrmex (1), allied to *Myrmecia*
Procerapachys (2), allied to *Cerapachys* and *Lioponera*
Bradoponera (1), allied to *Discothyrea* and *Spaniopone*
Electroponera (1), allied to *Ectatomma*
Nothomyrmica (4), allied to *Tetramorium*
Stiphromyrmex (1), allied to *Pristomyrmex*
Parameranoplus (1), allied to *Meranoplus*
Enneamerus (1), allied to *Myrmicaria*
Protaneuretus (1), allied to *Aneuretus*
Paraneuretus (2), allied to *Aneuretus*
Rhopalomyrmex (1), allied to *Plagiolepis* and *Myrmelachista*
P♀dimorphomyrmex (1), allied to *Dimorphomyrmex*
Glaphyromyrmex (1), allied to *Formica*
Dryomyrmex (2), allied to *Aphomomyrmex*

2. Of uncertain affinities:
Electromyrmex (1)
Agrœcomyrmex (1)
Stigmomyrmex (1)
Asymphylomyrmex (1)
Pityomyrmex (1)

It will be seen from this conspectus that all the Baltic amber ants belong to genera which are either still restricted to the Old World or represented also in the nearctic and neotropical regions, with the single exception of *Erebomyrma*. It must be stated, however, that this list does not bring out the fact that there is little affinity with the African fauna, which is practically devoid of one whole subfamily, the *Dolichoderinæ*, so highly developed in the amber, and that the genera *Sima, Monomorium, Plagiolepis* and *Œcophylla,* though occurring in Africa, have even a stronger specific representation in the Indomalayan region. The genus *Erebomyrma,* at first sight, points to a purely neotropical affinity, but further consideration shows that this case admits of a very different explanation. This genus was founded on a single Texan species (*E. longi* WHEELER), to which EMERY later added another from Peru *(E. peruviana).* The occurrence of a species (*E. antiqua* MAYR) in the Baltic amber merely shows that the genus was at one time cosmopolitan. Its affinities, moreover, are closest to a group of Old World *Solenopsidii (Aëromyrma,*

Pheidologeton, Oligomyrmex and *Carebara).* This explains why MAYR originally described *E. antiqua* as a *Pheidologeton,* and why EMERY later assigned it to *Aëromyrma,* after he had discovered a species of this genus *(A. sophiæ)* in the Sicilian amber[1]). It is, indeed, not improbable that species of *Erebomyrma* may still exist in the Old World tropics, just as a species of *Carebara* has recently been discovered by SANTSCHI to occur in South America. The case of *Erebomyrma antiqua* thus bears an interesting resemblance to that of the Cicindelid beetle *Tetracha carolina* L. Until recently this insect was supposed to belong exclusively to America, where it ranges over the southern United States, Central America, West Indies and South America (Chili and possibly Argentina), but HORN[1]) has discovered a specimen of it in the Baltic amber. He regards the species of *Tetracha,* and especially *T. carolina,* as among the most ancient and primitive of the Cicindelidæ, and it is clear that it must, like *Erebomyrma,* once have inhabited the eastern hemisphere. In order to account for its occurrence in the amber he resorts to the following hypotheses: „Wie die Bernstein-*Tetracha* nach dem preußischen Samland gewandert ist, bleibt eine andere Frage. Zwei Wege wären möglich: I. der eine direkt von Afrika aus (vielleicht über die egyptische Landbrücke oder östlich davon, um dann auf dem umgekehrten Weg von II nach Amerika zu gelangen); II. von Amerika aus über die nearktische und skandinavische Landmasse, was mir zum mindesten nicht unwahrscheinlich erscheint." It is clear that one might advance similar suppositions in regard to *Erebomyrma,* but for the present I deem it unnecessary to go beyond the facts, which show that both *Tetracha* and *Erebomyrma* were cosmopolitan genera during the Eocene and that their present restriction to the neotropical region is due to their later extinction in the Old World. A similar statement would probably cover many, if not all, of the cases of supposedly close nearctic and neotropical affinities among the insects of the Baltic amber.

Having thus excluded the ant-faunas of Africa and America from any demonstrable participation in the composition of the amber fauna, except in so far as these countries have several genera in common with the Eurasian continent, we may turn to a consideration of the relationship of the amber to the present Eurasian and Australian

[1]) Le Formiche dell'Ambra Siciliana, etc. loco citato, p. 577.

[1]) Über das Vorkommen von *Tetracha carolina* L. im preußischen Bernstein und die Phylogenie der *Cicindela*-Arten. Deutsch. Ent. Zeitschr. 1906. Heft II, pp. 329—336.

ants. For this purpose we may divide the amber genera into two groups: those which are today represented in Europe and Siberia and those either belonging to the Indomalayan and Australian fauna, or with more or less pronounced affinities to this latter fauna. To the first group belong the following 13 genera, with 44 species:

Ponera (2)	Liometopum (1)
Monomorium (2)	Plagiolepis (6)
Stenamma (1)	Prenolepis (2)
Aphænogaster (3)	Lasius (5)
Myrmica (1)	Formica (6)
Leptothorax (5)	Camponotus (1)
Dolichoderus (9)	

The remaining 30 genera and 48 species may be referred to the second group. Among these, however, there are certain genera, such as *Prionomyrmex, Rhytidoponera* and some of the species of *Iridomyrmex* (e. g. *I. geinitzi*), which show decided affinities to existing Australian forms, others *(Protaneuretus, Paraneuretus)* which are closely related to the Indian *Aneuretus* and still others *(Vollenhovia, Parameranoplus, Enneamerus, Dimorphomyrmex, Gesomyrmex, Pseudolasius, Dryomyrmex)* and several species of *Dolichoderus*, which are more like forms now living in the Malay Archipelago. This last fauna, however, comprises an admixture of Indian and Australian types and in this respect most closely resembles the amber fauna. But the aspect of the latter is peculiar, owing to the absence of the genus *Polyrhachis* and the very poor development of the genus *Camponotus*, both genera represented by a great number of species in the Malayan fauna.

We must, therefore, regard the ant fauna of the Baltic amber as a mixture of what at the present day we are able to recognize as at least four different faunas, the palearctic, the Indian, the Malayan and the Australian, with a little more than $^1/_3$ of the genera and nearly $^1/_2$ of the species palearctic and the remainder belonging to Indomalayan and Australian types. The proportion of individuals in these different faunas will be seen to differ greatly if we omit the two dominant species, *Iridomyrmex gœpperti* and *I. geinitzi,* to which belong more than half of all the specimens examined, for the genera represented by the greatest number of remaining specimens are *Formica* (1336), *Lasius* (1257) and *Prenolepis* (684), or a total of 3277 specimens of the 4961 left after subtracting the 6717 contributed by *I. gœpperti* and *geinitzi.* It should also be noted that the single species of *Dolichoderus (D. tertiarius)* which is most like the living *D. quadri-*

punctatus of Europe, is represented by 494 specimens. Subtracting this number also from the 4961 specimens, we have left only 1190 specimens to represent all the remaining species and genera. It will be seen, therefore, that most of the species of truly extra-European affinities were rare in the amber forests and that the most abundant ants, apart from the two species of *Iridomyrmex,* belonged to *Formica* and *Lasius,* which are even today the two dominant European genera[1]). A pronounced tendency towards a supplanting of the Indian, Malayan and Australian elements in the mixed amber fauna by palearctic elements is therefore very apparent as far back as Lower Oligocene times, although it seems to have been permanently accomplished only by the advent of the Glacial Epoch.

The foregoing considerations suggest several questions that are not easily answered. Did all the amber species coëxist as members of a single fauna throughout the life-time of the amber forests or did they belong to successive faunas, the Indomalayan and Australian elements belonging to an earlier and warmer, the palearctic to a later and cooler portion of the Lower Oligocene? Or were the differences of altitude or latitude or of both in the amber forests sufficient to produce two different faunas which coëxisted though occupying different stations? Answers to these questions can come only from a more precise knowledge of the conditions under which the amber was formed and preserved. That the amber forests were rather extensive is clear from Tornquist's statement[2]) that their southern boundary extended across what is now central Sweden eastward through Finland and Estland and up the Dvina River to Minsk and Tobolsk in Western Russia, while the adjacent sea covered not only what is now northern Germany but also the region drained by the Vistula, Niemen and Dnieper Rivers as far as the Black Sea. That the climate of the amber country was subtropical is evident from its vegetation. Some of the earlier paleontologists, like Heer, were convinced that the country was not flat, but mountainous, and that the masses of hardened amber were detached from the trees and with other vegetable detritus carried down by torrents to the region in which they are now found, namely the bed of the Baltic Sea and the soil of northern Germany which it once covered.

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[1]) *Prenolepis* is still a dominant genus in North America and tropical Asia but has ceased to occupy this position in Europe.

[2]) Geologie von Ostpreußen, 1910.

In this connection it will be of interest to quote the remarks of HEER[1]) although he gives a more southern boundary to the original amber forests than TORNQUIST. „Wahrscheinlich", he says, „waren die Bernsteinwälder auch über Skandinavien verbreitet, und manche Nadelhölzer mögen dort bis in die höhern Gebirge hinaufgereicht haben. Da dieses Bernsteinland von Skandinavien bis nach Deutschland hinüberreichte und dort im Süden durch ein Meer vom übrigen deutschen Festland getrennt war, durfte darin wohl der Grund der beträchtlichen Verschiedenheit der Bernsteinflora und Fauna zu suchen sein und wir hätten hier den skandinavischen Typus der tertiären Naturwelt vor uns, vielleicht gemischt mit dem montanen und subalpinen. Wir haben nämlich zu berücksichtigen, daß die im Bernstein eingehüllten Pflanzen und Tiere in den zierlichen Särgen, in welchen sie uns aufbewahrt wurden, weithin verführt werden konnten, ohne im geringsten zu leiden und sie so eine ganz ausnahmsweise Stellung einnehmen, wie wir sie sonst bei keinen vorweltlichen Pflanzen und Tieren treffen. Denken wir uns, daß aus dem jetzigen Schweden ein Fluß in der Gegend von Danzig in das damalige Tertiärmeer ausgemündet habe, kann derselbe sehr leicht Bernsteinharze aus großen Entfernungen und von den Gebirgen Schwedens nach jenen Gegenden geführt haben, und es können sonach die Bernsteineinschlüsse aus einem sehr großen Areal und aus Niederungen und Gebirgsgegenden stammen, ja vielleicht auch aus verschiedenen Epochen. Es könnte sein, daß Bernsteinwälder noch in Skandinavien bestanden haben, zu einer spätern Zeit als die der samländischen Flora. Bei einer solchen Annahme erklärt sich uns die Tatsache, daß bei Pflanzen und Tieren die Mischung nördlicher und südlicher Formen noch viel auffallender ist als bei der übrigen europäischen Tertiärwelt und daß namentlich mehrere hochnordische und auch montane Typen vorkommen."

This view of the topography of the amber country has received most unexpected confirmation through the recent work of ULMER on the caddice-flies. He finds that of the 30 recent genera of these insects represented in the amber, the larvæ of 13% must have lived in strongly agitated water, 8% in standing water and 4% in slowly-flowing streams, and he concludes that fully 35 genera with 73 species known from the amber, passed their larval life in torrents, that 14 genera with 7 species lived in quiet water and that 7 genera with 7 species were probably indifferent to their aqueous habitat. While

[1]) Untersuchungen über das Klima und die Vegetationsverhältnisse des Tertiärlandes. Winterthur, Wurster & Comp. 1860, p. 109.

this suggests the possible coëxistence of different ant-faunas at different elevations, the fortuitous deposition of pieces of amber of different provenience in regions far from those in which the insect inclusions were acquired, precludes all argument in favor of the coëxistence of species found at the present time in the same deposit. It does not, however, preclude the possibility of determining the former coëxistence of species now found together in the same pieces of amber, for it is, of course, very evident that simultaneous inclusion could only have occurred in the case of forms living at precisely the same time and place. Among the materials examined I have noted the following instances of such simultaneous inclusion:

Iridomyrmex gœpperti with *Dolichoderus tertiarius*
I. gœpperti with *Nothomyrmica rudis*
I. gœpperti with *I. geinitzi*
I. gœpperti with *Lasius schiefferdeckeri*
I. gœpperti with *Dimorphomyrmex annectens*
I. gœpperti with *Formica flori*
I. schiefferdeckeri with *F. constricta*
F. flori with *Camponotus mengei*
F. horrida with *Leptothorax gracilis*
I. geinitzi with *I. samlandicus.*

We are fully justified, therefore, in concluding that *I. gœpperti* existed at the same time and ranged over the same territory as *Dolichoderus tertiarius, N. rudis, I. geinitzi, L. schiefferdeckeri, F. flori* and *Dimorphomyrmex annectens.* But, strictly speaking, this might only indicate that *I. gœpperti* was a very abundant form, spread over the whole amber area and persisting throughout its whole duration. It is still possible to suppose that the other species enumerated above may each have had a more limited distribution in space and time. In other words, *F. flori, C. mengei, L. schiefferdeckeri* may have occurred only at high altitudes, forms like *Sima, Dimorphomyrmex, Œcophylla, Dryomyrmex, Prionomyrmex*, etc., may have lived only in the low jungles, while *I. gœpperti* was much more eurythermal and therefore ubiquitous. Such a distribution would be much like that of the present day ants in such mountanous portions of the tropics as Mexico and Central America. Nevertheless, the view that the tropical and boreal components of the amber ant-fauna belonged to different periods of the Oligocene and did not coëxist at different altitudes or latitudes is clearly favored by the fact that in individual representation the boreal are so greatly in excess of the tropical species. This is just what we

should expect, if the tropical preceded the boreal forms as the vanishing survivors of an ancient and once dominant fauna, but if the boreal forms had been brought down by rivers or torrents from higher altitudes or latitudes, one could hardly expect them to outnumber the specimens from the lowlands.

The foregoing cases of simultaneous inclusion of different species are, of course, too meager to give us any adequate solution of the questions I have been considering, but they show that such a solution may be possible sometime in the future. At any rate they suffice to prove the desirability of recording all cases of simultaneous inclusion as the amber material accumulates in collections and of not isolating specimens in separate pieces of amber till the associated species have been recorded.

That the mixed tropical and boreal character of the European ant fauna lingered on through the Miocene in Central and Southern Europe is demonstrated by the species in the formations of Oeningen and Radoboj and the inclusions in the Sicilian amber. This last formation, indeed, is almost purely tropical, with such genera as *Cataulacus*, *Meranoplus*[1]), *Hypopomyrmex, Podomyrma, Leptomyrmula*, *Gesomyrmex, Œcophylla, Ectatomma, Technomyrmex* and *Aëromyrma*. In the Pleistocene the tropical components disappeared, at least from the fauna of Northern and Central Europe, leaving only the palearctic forms mostly congeneric or even cospecific with nearctic forms, and of these only a few have survived the Glacial Epoch. During this period the region in which the luxuriant ant-fauna of the Baltic amber flourished must have been completely sterilized and has only since been repeopled with a scant fauna from southern Europe. The meagerness of the surviving fauna in the region formerly covered by the amber forests may be estimated from the work of ADLERZ on the ants of Sweden[1]). This author cites only 12 genera with 35 species, as follows:

Myrmica (6)	Anergates (1)
Solenopsis (1)	Tapinoma (1)
Formicoxenus (1)	Lasius (6)
Harpagoxenus (1)	Formica (11)

[1]) In a recent paper EMERY (Le origini e le migrazioni della fauna mirmecologica di Europa. Rendic. Ses. R. Accad. Sci. Ist. Bologna 1913 pp. 29—46) refers to this genus a male specimen which he described as a *Crematogaster*.

[1]) Myrmecologiska Studier. II Svenska Myror och deras Lefnadförhållanden. Bih. till K. Svenska Vet.-Akad. Handl. 11, 18, 1886, pp. 1—329 7 plates.

Leptothorax (3)	Polyergus (1)
Tetramorium (1)	Camponotus (1).

The other palearctic genera represented in the amber: *Ponera, Stenamma, Aphænogaster, Dolichoderus, Liometopum, Monomorium, Prenolepis* and *Plagiolepis* do not at the present day extend northward beyond southern and central Europe. In two recent papers[1]) Emery has described in detail the way in which the present south European ant-fauna has been enriched by immigration of species from Asia and Africa.

Before leaving the subject of the affinities of the amber ants, it may be of interest to consider some of Ulmer's conclusions in regard to the amber Trichoptera. He arranges the genera of these insects according to their affinities with extant genera as follows:

1. Purely Eurasian: 10 genera with 15 species.
2. Purely Nearctic: 4 genera with 8 species.
3. Eurasian and (or) Nearctic: 33 genera with 115 species.
4. Neither Eurasian nor Nearctic but South Asiatic: 9 genera with 14 species.

From these data he concludes: „Die Trichopterenfauna des Bernsteins ist eine hauptsächlich aus eurasiatischen und nearktischen Elementen bestehende, aber von südamerikanischen und südasiatischen Formen durchsetzte Mischfauna mit subtropischem Charakter und vorwiegender Entwicklung der Polycentropiden.“ It will be seen that this statement corresponds rather losely with the results obtained from a study of the amber *Formicidæ,* except that the present neotropical element is represented only by *Erebomyrma antiqua* and possibly by the resemblance of *Rhopalomyrmex* to the South American and West Indian genus *Myrmelachista* and of *Bradoponera* to the Haitian *Spaniopone,* and that there is no purely nearctic element apart from genera common to the palearctic fauna.

Referring to the direct phylogenetic relationships of the amber Trichoptera to those of the present day, Ulmer says[2]): „Da die Bernsteinfauna um so viel älter ist als die rezente, so könnte sich die Frage erheben, ob vielleicht im Bernstein Vorläufer, Ahnen der einen oder anderen rezenten Gattung vorhanden sind, ob vielleicht gar die Formen im ganzen primitiver sind als die der Jetztzeit. Die Frage muß sofort verneint werden. Man braucht nur die Beschreibungen

[1]) Der Wanderzug der Steppen- und Wüstenameisen von Zentral-Asien nach Süd-Europa und Nord-Afrika. Zool. Jahrb. Abth. f. Syst. Suppl. 15. Vol. 1. 1912. pp. 95 bis 104 and Le origini e le migrazioni della fauna mirmecologica di Europa loc. cit.

[2]) loco citato p. 361.

und Figuren der Bernsteinformen mit denen rezenter zu vergleichen oder noch besser die Bernsteinstücke selbst mit jetzt lebenden Arten), um sofort zu sehen, daß die Fauna des Bernsteins absolut nicht niedriger organisiert ist; wir haben dort dieselben Familien und Gattungen wie in der Jetztzeit, selbst diejenige Familie, die als höchst spezialisiert gilt (Sericostomatidæ), ist recht zahlreich vertreten, wir haben dort die gleichen Verschiedenheiten im Bau der Fühler, Taster, Beine, Genitalorgane, eine ebenso mannigfaltige Ausbildung der Nervatur usw.; die Trichopteren des Bernsteins sind also genau so weit spezialisiert wie die rezenten Formen, die Bernsteinfauna ist in diesem Sinne vollständig modern, so modern, daß man — wenn man nur die Beschreibungen liest und die Figuren ansieht — glauben könnte, eine bisher unbekannte rezente Fauna sei hier dargestellt. Es findet sich im Bernstein allerdings keine einzige rezente Art; die Bernsteinarten sind sämtlich ausgestorben; auch zahlreiche (26—56) Gattungen sind zugrunde gegangen."

I am able to subscribe to this statement, mutatis mutandis, so far as the *Formicidæ* are concerned, with a few reservations, which, however, are not without significance. MAYR long ago called attention to the striking resemblances between certain amber ants and species living in Europe at the present day. These species are:

Ponera atavia and *P. coarctata* LATR.
Prenolepis henschei and *P. nitens* MAYR.
Lasius schiefferdeckeri and *L. niger* L.
Formica flori and *F. fusca* L.

I would add to these:

Dolichoderus (Hypoclinea) tertiarius and *D (H.) 4-punctatus* L.
Lasius nemorivagus and *L. umbratus* NYL.
Formica horrida and *F. cinerea* MAYR.
F. phaëthusa and *F. truncicola* NYL.

The resemblance between the ants in the first and the corresponding species in the second column is so close as to amount almost to identity in certain cases, and the simplest assumption seems to me to imply a lineal descent of the latter from the former. Moreover, some of the amber species are perceptibly more generalized or primitive in their structure than their nearest modern allies. This is true e. g. of *Bradoponera meieri*, which is more primitive than any of the recent genera of Proceratii, except, perhaps, *Spaniopone*. *Prionomyrmex* is more primitive than the most primitive of modern Formicid genera, the allied *Myrmecia*. *Procerapachys* is also a very ancient type. The

amber species of *Œcophylla* are somewhat more primitive and more closely related to *Gesomyrmex* and *Dimorphomyrmex* than is the recent *Œ. smaragdina* of the Old World tropics. The genera *Protaneuretus* and *Paraneuretus* are certainly archaic types and related to the single existing species of *Aneuretus (A. simoni* Emery) of Ceylon, which is justly regarded as a connecting link between the subfamilies *Ponerinæ* and *Dolichoderinæ*. Apart from these and possibly a few other exceptions, however, the amber ants are as highly specialized as existing forms and one would not be surprised to find living species of any of the extinct genera turning up in certain little explored portions of the Old World tropics, just as a living species of *Gesomyrmex* was found in Borneo years after this genus had been discovered in the amber.

Not only is the generic and specific habitus of the amber ants very highly specialized, but their various castes or phases are as sharply differentiated and in precisely the same manner as in our recent forms. Although all this could be readily inferred from Mayr's work of 1868, we find an extraordinary statement by a geologist of high repute, Joseph Leconte, in his well-known „Elements of Geology" published in 1884. Misled by the fact that nearly all the Miocene ants preserved in the lacustrine formations of Florissant, Oeningen and Radoboj are males and females, he says: „It is probable that ants at first were only winged males and females living in the open air like other insects. The wingless condition and the neutral condition are both connected with their peculiar social habits and instincts, and have been gradually developed along with the development of their habits and instincts. It is probable that all these remarkable peculiarities, viz. the wingless condition, the neutral condition, the wonderful instincts, and organized social habits, have been developed together since the Miocene Epoch." So far is the latter portion of this statement from being true that we may confidently assert that the differentiation of the worker caste among these insects must have been completed before the beginning of the Tertiary and therefore not later than the Cretaceous or even the Jurassic or Triassic periods.

In two of my former publications[1]) I stated that I was unable to detect any evidence that the ants of the Baltic amber had developed any dimorphism or polymorphism within the limits of the worker caste

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[1]) Comparative Ethology of the European and North American Ants. Journ. Psychol. u. Neurol. XIII, 1908, pp. 404—435, 4 pls. and 6 text-figs; and Ants, their Structure, Development and Behavior, Columbia University Press, 1910, p. 174.

itself, like that so frequently seen in several recent genera, and I therefore concluded that this differentiation must have occurred since the Lower Oligocene. I now see that this statement was not only premature but erroneous. While it is undoubtedly true that most of the species have only monomorphic workers, and while the workers of *Camponotus mengei* are not distinctly differentiated into major and minor phases as in most of the living species of the genus, but correspond to what are designated as intermediates or mediæ, I have recently discovered unmistakable major and minor workers in *Pseudolasius boreus* and *Dimorphomyrmex theryi,* as will be seen from the description of these ants in the body of this work. It is evident therefore that even this peculiar specialization had been attained by certain ants of the Baltic amber, although it still remains true that no species has been discovered which has pronounced soldier and worker forms like the modern species of *Pheidole, Oligomyrmex, Pheidologeton* etc. The minute size of the worker of *Erebomyrma antiqua,* as compared with the male and female, however, would indicate, if EMERY's view is correct[1]), that a soldier form must not only have existed, but have already disappeared in the ancestor of this species before the days of amber formation.

The di- or polymorphic differentiation of the worker is not, however, the only intraphasic specialization in which the amber ants had anticipated their modern congeners. I have also detected the existence of ergatoid and pseudogynic females and ergatomorphic males, all peculiar specializations of the male and fertile female phases, which we should be inclined to regard as of much more recent origin than the polymorphism of the worker. The only known females of *Bradoponera meieri* (XXB 1933) and *Platythyrea primæva* (K 5122) are of the ergatoid, or apterous type and resemble the females of some recent species of *Anochetus* and *Odontomachus*. EMERY has figured and described a pseudogynic *Camponotus mengei*[1]), and I have seen two pseudogynes of *Prenolepis henschei* (Fig. 57). Among thousands of specimens of the closely allied North American *P. imparis* SAY, to which the European *P. nitens* MAYR is now attached as a subspecies, I have found only a single pseudogyne. This, however, closely resembles the two amber specimens. But more unexpected than these ergatoid and pseudogynic females in the amber is the male of *Irido-*

[1]) Die Entstehung und Ausbildung des Arbeiterstandes bei den Ameisen. Biol. Centralbl. XIV, 1894, pp. 53—59.

[1]) Deux Fourmis de l'Ambre, etc. loco citato p. 189 Fig. 2.

myrmex constrictus (7595/309 [Fig. 42]). Mayr, who discovered this singular specimen, regarded it as a gynandromorph, but I believe that it is an ergatomorphic male of the extreme type, such as is found in a few recent ants, notably in males of *Formicoxenus nitidulus* and *Ponera punctatissima*, which have the head much more like that of the worker than in many ergatomorphic males of the genera *Cardiocondyla*, *Symmyrmica* and *Technomyrmex*.

The larval and pupal stages of the Baltic ants were also in all respects as highly specialized and of the same structure as those of recent species. I have seen larvæ and pupæ of *Iridomyrmex geinitzi*, *I. gœpperti* and *Lasius schiefferdeckeri*. The *Lasius* pupæ are enclosed in cocoons, while those of *I. geinitzi* are naked, showing that the cocoon-spinning habit of the larvæ had been lost in the *Dolichoderinæ* as far back as the early Tertiary. This is of considerable interest, because it has been inferred from the occasional occurrence of both naked and enclosed pupæ in the same colony of certain species of *Formica (F. fusca,* etc.*)* that the loss of the cocoon is a mutation, or saltatory variation of recent origin. This may, of course, be true in *Formica* and some other Camponotine genera, but it is quite as probable, in view of the extraordinary persistence of small characters displayed in the preceding paragraphs, that the pupæ of *F. flori* may have shown the same presence or absence of the cocoon in the same colony as is shown by the modern *F. fusca.*

There are also unmistakable indications that the habits and instincts of the amber ants were nearly if not quite as advanced as those of existing forms. The method of their preservation and the close affinities of most of the species with modern arboreal forms have already been considered. That many of them had learned to attend plant-lice and had therefore become „trophobiotic" is shown by a block of amber in the Königsberg Coll. containing a number of workers of *Iridomyrmex gœpperti* together with a lot of their Aphid wards. That the amber ants kept myrmecophiles in their nests can scarcely be doubted, for at least three genera of *Paussidæ* (*Cerapterus, Pleuropterus* and an undescribed genus) are cited by Klebs in his list of amber Coleoptera[1]). That these ants also had Acarine parasites is shown by two workers of *Lasius schiefferdeckeri* in the Königsberg Coll., each bearing a mite attached to the base of one of the hind tibiæ (Fig. 58).

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[1]) Ueber Bernsteineinschlüsse im allgemeinen und die Coleopteren meiner Bernsteinsammlung. Schrift. Physik.-ökonom. Gesellsch. Königsberg LI, 1910, 2, pp. 217 bis 242.

These specimens also show that the mites had already acquired the peculiar habit of affixing themselves to very definite regions of their host's integument.

Not only had the ants of the Lower Oligocene acquired very interesting relations with other insects, but they had, in all probability, established parasitic relations with one another like those found among the recent slave holders and temporary social parasites. I have examined the clypeus of all the specimens of *Formica* in the hope of finding the fore-runner of *F. sanguinea,* though in vain. But the singular ant, which I have called *Pityomyrmex tornquisti,* notwithstanding the fact that it belongs to the subfamily *Dolichoderinæ,* bears a striking resemblance to the living palearctic *Polyergus rufescens* and may have had similar habits. *Formica phaëthusa,* which is very closely related to *F. truncicola,* is a member of the *rufa* group, and since all the known forms of this group are temporary social parasites, as WASMANN and I have shown, it is very probable that the amber species established its colonies with the aid of *F. flori* colonies, just as the modern *F. truncicola* and *rufa* and their various subspecies *(integra, obscuriventris, pratensis,* etc.*)* use *F. fusca* or some one of its varieties for this purpose. As it has recently been shown by EMERY, WASMANN and CRAWLEY that *Lasius umbratus* and *L. fuliginosus* are tempory social parasites, the former on *L. niger,* the latter on *L. umbratus,* we may infer that the amber *L. nemorivagus,* which is very closely related to *L. umbratus,* was probably a temporary social parasite of *L. schiefferdeckeri.* And as the living forms most closely allied to *Erebomyrma antiqua (Carebara vidua, Aëromyrma nossindambo* and *Erebomyrma longi)* live in lestobiosis with termites, we may assume that the amber species had very similar habits, especially as several species of termites are known to occur in the same geological formation.

The general impression thus left on the mind by a study of the *Formicidæ* is one of wonder at the great exuberance of the group in the early Tertiary of Europe and the conviction that since this period the family has not only failed to exhibit any considerable taxonomic or ethological progress but has instead suffered a great decline in the number of species and therefore also in the variety of its instincts, at least in Europe. There has, undoubtedly, been a development of many new species, subspecies and varieties and an elimination of many stenothermal forms in various parts of the world during the late Tertiary and the Quaternary and possibly also a greater precision and specialization in minor instincts, but the differentiation of the subfamilies and genera of many species, of polymorphism, of the larval

and pupal stages and even of very special habits and relationships to other insects and of the ants to one another, was all accomplished before the Lower Oligocene and not, as Le Conte erroneously imagined, since the Miocene.

As no ants are known from the periods antedating the Baltic amber, we can offer only the vaguest of conjectures concerning the time and place of their origin as a family. The leading authority on fossil insects, Prof. Anton Handlirsch[1]) states that „die ersten Hymenopteren, tiefstehende symphyte Formen aus der Verwandtschaft der Holz- und Blattwespen, erst im oberen Jura auftreten und daß Ameisen erst im unteren Tertiär gefunden werden, das erste Auftreten dieser hochstehenden Familie also kaum vor der oberen Kreide erfolgt sein kann". This reasoning, however, does not seem to me to be very cogent in view of the fact that so very few Mesozoic insects are known and the evident possibility that ants may very well have coexisted with primitive phytophagous Hymenoptera during the Jurassic, just as Blattoidea, or cockroaches, a much more primitive group than the lowly Symphyta, coexist at the present day with highly specialized and very recently evolved insects.

Handlirsch has also hazarded an opinion in regard to the place of origin of the family *Formicidæ*. After considering several interesting cases of discontinuous distribution among these insects, he says: „Wenn wir nun noch berücksichtigen, daß es außer diesen Gattungen mit diskontinuierlicher Verbreitung auch eine Reihe von fast über die ganze überhaupt für Ameisen bewohnbare Erde verbreiteten artenreichen Gattungen gibt, wie *Aphænogaster, Formica, Camponotus* u. a., und daß auch diese schon im europäischen Tertiär reich vertreten waren, wenn wir ferner bedenken, daß allem Anscheine nach die tertiäre Ameisenfauna Nordamerikas weit weniger formenreich ist als die europäische, so drängt sich uns unwillkürlich die Ansicht auf, es sei der Entwickelungsherd der ganzen Familie *Formicidæ* (im weiteren Sinne) in den alttertiären oder oberkretaischen Kontinentalmassen Eurasiens zu suchen und die hier entstandenen Formen seien über östliche oder westliche Landverbindungen der nördlichen Halbkugel nach Nordamerika gelangt, von dort ebenso nach Süden vorgedrungen, wie von Europa und Asien. Manche Genera haben überall standgehalten, andere dagegen sind in der ursprünglichen Heimat erloschen oder nur als Relikte erhalten, wieder andere sind überhaupt nur mehr an einzelnen günstigen Punkten erhalten geblieben und können als absolute

[1]) Ueber Relikte, loco citato p. 185.

Relikte bezeichnet werden. Diese Betrachtungsweise schließt jedoch nicht aus, daß sich auch an manchen Stellen abseits von der Urheimat neue Genera differenziert haben können, die wir dann als Endemismen zu bezeichnen hätten. So weit ich momentan die Sache überblicken kann, scheint mir jedoch in keinem Falle zur Erklärung der Ameisenverbreitung die Annahme großer versunkener Kontinente, die einst quer über die großen Ozeane reichten, notwendig zu sein; daß solche Kontinente nie existierten, soll damit natürlich noch nicht behauptet sein."

While I agree with HANDLIRSCH that we need not, in the present state of our knowledge of Formicid distribution, postulate the existence of great sunken continents, and while I am willing to admit that the family may have originated in Eurasia, I am unable to lay much stress on his reasons for this latter assumption. In the first place, as I have partially shown on p. 9, the number of cosmopolitan or even of tropicopolitan genera in the European Tertiary is not great. *Formica* is by no means cosmopolitan, and this genus as well as *Aphænogaster* and *Camponotus* would very probably not be found to be richly represented in the later Tertiary if the species referred to them by HEER and other students of his day were to be reëxamined in the light of modern taxonomic definitions. In the Baltic amber there is only one species of *Camponotus* and though there are three of *Aphænogaster,* two of these are represented by only a few specimens. In the second place, a hasty preliminary examination of several thousand ants from the Florissant shales of Colorado, which are attributed to the Miocene, indicates that the North American Tertiary ant-fauna was by no means as insignificant as HANDLIRSCH seems to imply. As the existence of these numerous fossils makes it very probable that there must have been ants in North America during the Eocene, the migration of the family from Eurasia, if it took place as HANDLIRSCH supposes, must have antedated the beginning of the Tertiary at the latest. I deem it advisable, however, to postpone further discussion of this subject, till I can take it up with fuller and more precise data in my work on the fossil ants of Florissant.

FAMILY FORMICIDÆ.

Subfamily Ponerinæ Mayr.

Tribe Prionomyrmicini, trib. nov.

Genus ***Prionomyrmex*** Mayr.

This very interesting genus was established by Mayr on a single imperfect worker in the Berendt collection. Examination of eight specimens, some of which are in an excellent state of preservation, enables me to add the following details to his generic description: The clypeus is triangular, projects forward and is acutely pointed in the middle; it is flattened or feebly concave and fills out the space between the bases of the long, ensiform, denticulate mandibles when they are closed. Maxillary palpi 6-jointed; labial palpi 4-jointed. Frontal carinæ subparallel, their anterior ends somewhat lobe-like and flattened, but small and horizontal. Frontal area absent. Eyes large and convex and at the middle of the sides of the head, not behind the middle, as stated by Mayr. Ocelli often absent. Antennæ 12-jointed, slender; funiculus filiform, without a club, all its joints decidedly longer than broad. All the tibiæ with pectinated spurs. Fourth tarsal joint deeply bilobed; claws stout, bidentate.

This genus, as Mayr has shown, is related to the Australian *Myrmecia,* which Emery rightly regards as comprising the most generalized of living ants. *Prionomyrmex* is even more primitive in its structure and therefore deserves to rank as the archetype of all known *Formicidæ,* for when we compare it with *Myrmecia,* we find that its mandibles, though greatly elongated, are not linear and specialized, but have a distinct and uniformly denticulate masticatory border, the clypeus is well-developed and the pedicel of the abdomen and gaster are more primitive and more like those of the *Ponerinæ* in general than in the Australian genus, in which the structure of these parts recalls that of certain *Myrmicinæ (Pseudomyrmini).*

Prionomyrmex longiceps MAYR.

Prionomyrmex longiceps MAYR, Beitr. Naturk. Preuß. I, 1868, p. 78, Taf. IV, Figs. 74, 75, ☿; DALLA TORRE, Catalog. Hymenopt. VII, 1893, p. 22; HANDLIRSCH, Fossil. Insekt. 1908, p. 879.

Worker (Fig. 1). Length 10—14 mm.

First funicular joint of antennæ about half as long as the second, the second the longest, and the succeeding joints gradually decreasing in length to the penultimate, which is a little shorter than the last joint. Surface of body smooth, very finely shagreened, but not punctate or rugulose. Hairs moderately abundant, erect or suberect,

Fig. 1. *Prionomyrmex longiceps* MAYR. Worker, K 5103.

short on the head, thorax, legs and scapes, somewhat longer on the abdomen. Pubescence indistinct, except in one specimen (B 259), in which it seems to be abundant but glued to the body by a white film.

Three specimens in the KLEBS Coll. (K 5103, K 1024 and A 129); and five in the Geolog. Inst. Koenigsberg Coll. (B 258, B 259, B 14762, and two without numbers). Two of the specimens in the latter collection lack the head; of the three others only one possesses ocelli. These organs are also lacking in the specimens from the KLEBS Coll. As would be expected, MAYR's ocellate individual and the one I have seen are both larger (14 mm) than the nonocellate individuals.

Male. Length (without gaster) 8 mm.

A single imperfect specimen, XIII B 924 of the Geolog. Inst. Koenigsberg Coll. unquestionably belongs to this species. It lacks the gaster, one antenna, the terminal joints of the other and the tips of the wings. Head short and broad, with very large, subspherical eyes and prominent ocelli. Mandibles small, far apart and with a single, acuminate tooth at the apex. Maxillary palpi very long, 6-jointed, labial palpi 4-jointed. Clypeus convex in the middle behind, not projecting, with straight, transverse anterior border. Antennæ very long, filiform; scapes very short, little more than twice as long as broad, somewhat thicker than the remaining joints, second joint (first funicular) broader than long, not swollen; remaining joints (8 of which are preserved) subequal, cylindrical, fully 6 times as long as broad. Thorax slender, through the wing insertions as broad as the head through the eyes. Mesonotum with distinct Mayrian furrows. Scutellum convex and rounded in the middle, broadly concave on the sides (as in *Myrmecia*). Epinotum from above as long as broad, with concave sides and armed with two blunt teeth. Petiole, postpetiole and legs very similar to those of the worker. Venation almost exactly like that of Myrmecia in both anterior and posterior wings; apterostigma small. Sculpture and pilosity as in the worker, but the hairs are shorter and less conspicuous. Body blackish or dark brown and more or less decomposed. Wings somewhat yellowish.

The long legs, strong claws and remarkable mandibles of the worker indicate that *P. longiceps* was a predaceous, and in all probability, an arboreal ant. It seems to have been the sole survivor during Lower Oligocene times of a very primitive Mesozoic group of Ponerinæ. There can be little doubt that the *Myrmeciæ* of Australia and the neighboring islands are the only living descendants of this old group.

Tribe Cerapachyini Forel.

Genus *Procerapachys*, gen. nov.

Allied to *Cerapachys*, *Sphinctomyrmex* and *Lioponera*. The general shape of the body of the worker is that of typical species of the first of these genera. Mandibles convex, pointed, with oblique, toothless blades. Maxillary palpi 5-jointed; labial palpi 4-jointed. Frontal carinæ prominent, erect, not covering the antennal insertions, parallel in front, converging behind, about 1/3 as long as the head, separated by a concavity as broad as the antennal scape. Cheeks with a distinct

carina parallel with the frontal carina, but shorter. Eyes large, round, convex, consisting of many minute ommatidia. Antennæ short, 12-jointed, scape thickened distally, funiculus not ending in a one-jointed club, the last being shorter than the two preceding joints together. Thorax rather short, cylindrical, without promesonotal or meso-epinotal sutures or depressions. Petiole stout, barrel-shaped, with a prominent, compressed anteroventral tooth. Postpetiole much larger than the petiole, separated by a pronounced constriction behind from the gaster. The latter is short and compact, without constrictions between the segments; its first segment longer and broader than the petiole, remaining segments very short, convex above and apparently somewhat deflected. Legs rather stout; all the tibiæ with well-developed, pectinated spurs. Genotype: *P. annosus* sp. nov.

Procerapachys differs from *Cerapachys* in the structure of the antennæ, which do not terminate in a one-jointed, glandiform club, and have longer and more uniform joints, much as in certain species of *Eciton*. From *Sphinctomyrmex* it differs in the structure of the abdomen which is much shorter and not constricted behind each segment. From *Lioponera* it differs in its heavy sculpture. In most of these characters and in the rather large size of the species, the new genus is of a more primitive type than its modern representatives. Its occurrence in the amber is of great interest because it shows that the *Cerapachyini,* now confined to the tropics and most abundantly represented in the Indian and Australian regions, had a much wider distribution during Oligocene times.

Procerapachys annosus, sp. nov.

Worker (Fig. 2a and b). Length 6—7,5 mm.

Head, excluding the mandibles, slightly longer than broad, a little broader behind than in front, with rather straight, subparallel sides, and, when seen from the front, with straight posterior border; seen from above the occipital border is broadly excised and on each side of it the head has a bluntly angular projection. Antennal scapes reaching to the eyes; joints 1—10 of the funiculus somewhat broader than long, terminal joint rather pointed, a little longer than broad. Ocelli sometimes present. Thorax cylindrical, slightly constricted behind and convex in the pleural region, a little more than twice as long as broad, slightly narrower than the head. Pronotum with a prominent transverse ridge behind the very concave neck. A similar ridge forms a border to the whole epinotal declivity, which is very flat and abrupt.

In one specimen (Fig. 2a) there is also a transverse ridge separating the pro- and mesonotal regions. Petiole narrower than the epinotum, distinctly longer than broad, as broad in front as behind, evenly rounded on the sides and above, with a flat, abrupt and vertical anterior

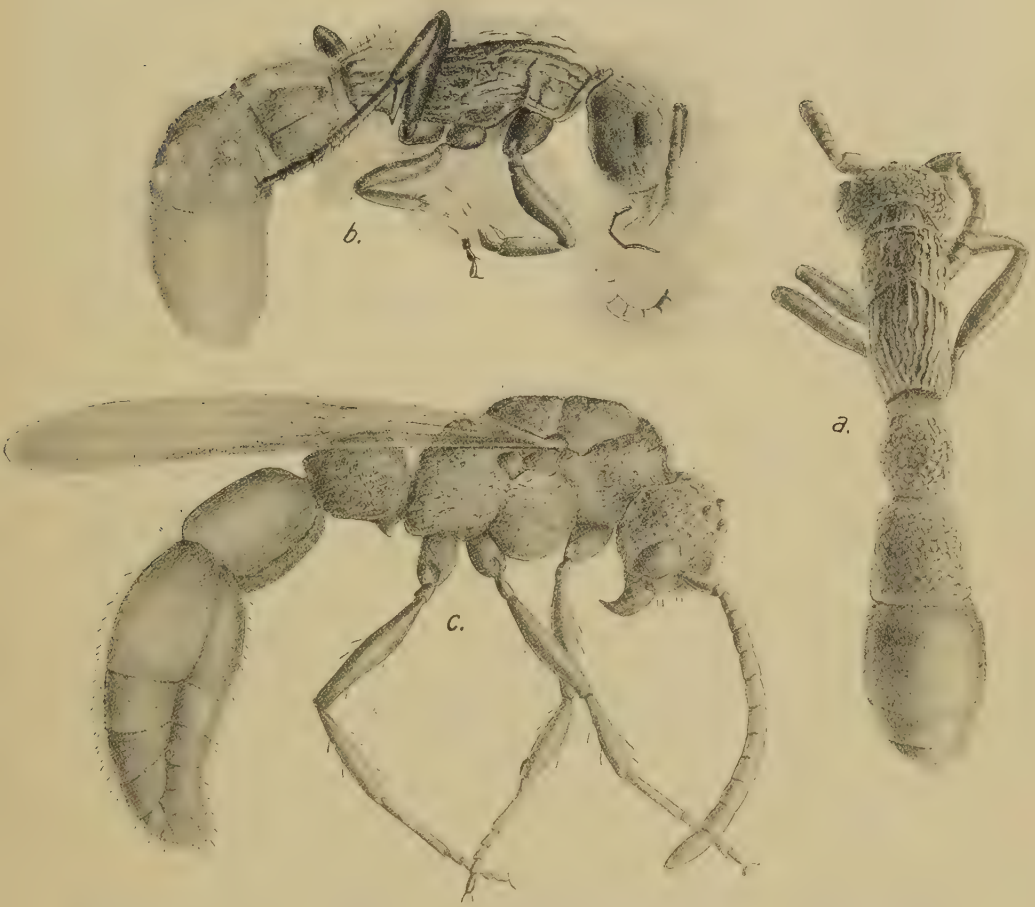

Fig. 2. *Procerapachys annosus* sp. nov. a) Worker, dorsal view; b) Worker, K 5793, lateral view; c) male, II B 225.

surface bordered by a ridge like that surrounding the epinotal declivity. Postpetiole $1^1/_2$ times as broad as the petiole, subcampanulate, broader behind than in front and scarcely longer than broad. First gastric segment somewhat broader than the postpetiole, as long as broad, with convex sides and dorsum; remaining segments very short, convex, and taken together much shorter than the first gastric segment.

Mandibles smooth; head densely punctate and covered with large, shallow foveæ which make it appear coarsely reticulate-rugose. Thorax with similar but larger and deeper foveæ in front, but with most of the dorsum and pleuræ traversed by very coarse, wavy, longitudinal rugæ, which converge somewhat behind and terminate in the ridge bordering the smooth epinotal declivity. Neck with similar rugæ which terminate behind in the pronotal ridge. Petiole and postpetiole covered with foveæ like those on the head, but larger, deeper and more conspicuous; on the dorsum of the petiole they have a somewhat concentric arrangement, on the sides they are replaced by longitudinal ridges like those on the pleuræ. Anterior vertical surface of the petiole smooth. First gastric segment densely punctate and with scattered foveolæ over its entire surface. Remaining segments apparently with a similar sculpture.

Hairs delicate, moderately abundant, short and erect on the body, scapes and legs. First and terminal gastric segments finely and rather densely pubescent.

Male (Fig. 2c). Color black. Length 9 mm.

Body slender. Antennæ rather long; scape cylindrical, slightly incrasated, hardly longer than joints 2—11 of the funiculus, which are subequal and somewhat shorter than the terminal joint; first funicular joint very short, broader than long. Mandibles well-developed, with straight, indistinctly denticulate masticatory borders. Clypeus with broadly rounded anterior border and very prominent median carina. Frontal carinæ long, straight, slightly diverging behind. Eyes and ocelli moderately large. Posterior corners of head prominent, posterior border with a raised margin. Thorax with distinct Mayrian grooves, propleuræ concave, mesopleuræ large and convex. Epinotum sloping and convex in front, its posterior surface concave and separated from the base by a prominent ridge which is distinctly notched in the median dorsal line. Petiole in profile as long as high, with straight, sloping anterior and slightly rounded dorso-posterior surface; its ventral surface with a large blunt, anteromedian tooth. Postpetiole campanulate, longer than the petiole, slightly longer than broad. Wings folded and in such a position that their venation cannot be described. Legs slender. Head, thorax and petiole very coarsely reticulate-rugose. Propleuræ longitudinally rugose. Postpetiole and gaster smooth, with concave, scattered, piligerous punctures.

Hairs short, erect and moderately abundant on the body, sparser on the legs.

Black; the chitin of the body more or less decomposed. Wings dark brown.

Described from one rather poor worker specimen from the KLEBS Coll., K 5793, which, however, shows very clearly the palpi and the sculpture of the sides of the body, three good worker specimens from the collection of the Geolog. Inst. Koenigsberg, No. IV, 7, 8094/702, and two without numbers. One of the latter (the ergatotype) is the largest of the series and has ocelli and the promesonotal ridge described above; the other lacks the head. The numbered specimen also has ocelli. We may infer, therefore, that in this primitive genus there was a tendency to produce ergatoid females like those we find today in various species of *Cerapachys (C. peringueyi)* and *Sphinctomyrmex (S. hedwigæ)*. The series comprises two males, B 5471 and II B 225, both in the collection of the Geol. Inst.; the former very poor, the latter (androtype) beautifully preserved and represented in Fig. 2 c.

Procerapachys favosus, sp. nov.

Worker (Fig. 3). Length 6 mm.

Closely resembling the preceding species in form but differing in sculpture. The head, thorax, petiole and postpetiole are coarsely reticulate-rugose, the head and postpetiole less sharply and distinctly than

Fig. 3. *Procerapachys favosus* sp. nov. Worker, B 18239.

the thorax and petiole, and in addition finely and densely punctate. On the thorax the sculpture stops behind at a ridge bordering the smooth and abrupt declivity of the epinotum and anteriorly at the transverse pronotal ridge. The neck is smooth and shining, at least in the mid-dorsal region. The sculpture of the gaster cannot be determined as the segments are obscured by small bubbles and a white film. Ocelli are present. The sides of the thorax and petiole are flatter than in *annosus,* but the shape of the head, antennæ and legs,

so far as can be seen, is very similar. The eyes are less convex. Only a few hairs are visible on the body and these are widely scattered and rather coarse. The appendages seem to be naked. Color black.

Described from one specimen (B 18239 type) in the collection of the Geolog. Inst. Koenigsberg.

Tribe Proceratini EMERY.

Genus *Bradoponera* MAYR.

Bradoponera meieri MAYR.

Bradoponera meieri MAYR, Beitr. Naturk. Preuss. I, 1868, p. 74, Taf. IV, Figs. 70, 71 ☿; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82.

Bradyponera meieri DALLA TORRE, Catalog. Hymen. VII. 1893, p. 18; HANDLIRSCH, Foss. Insekt. 1908, p. 879.

Worker (Fig. 4a). This phase was carefully described by MAYR from five specimens, at least one of which (No. 373/7659) is in the Geolog. Inst. Koenigsberg Coll. I have examined ten specimens from this collection (Nos. 545/9493; 991/1387; 373/7659; XXB 1283; B 18515; XXB 1933; XXB 2165; and two without numbers), but am able to add little to MAYRS description. He states that he was unable to give a clear account of the sculpture of the specimens as they were more or less covered with white films. I believe, however, that his description is, in the main, correct. The head is covered with coarse, umbilicate punctures, separated by very finely regulose intervals. The mandibles, clypeus, thorax and especially the abdomen are more finely and densely punctate. The thorax is delicately rugulose and on the sides with a distinctly longitudinal trend to the rugulæ. The scapes and legs are sparsely and coarsely punctate.

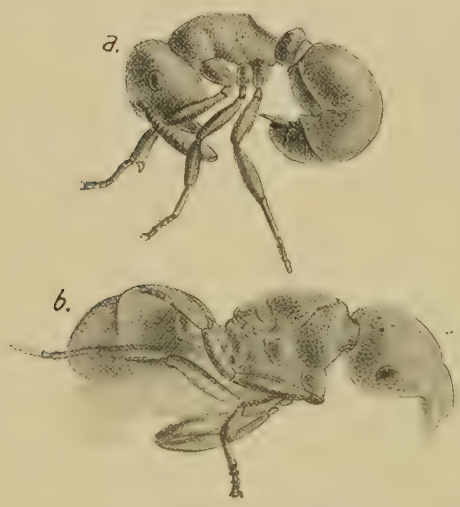

Fig. 4. *Bradoponera meieri* MAYR.
a) Worker, B 2165; b) Female, B 1933.

Female (ergatoid) (Fig. 4b). Length 3,25 mm.

A single specimen (XXB 1933) from the Geolog. Inst. Koenigsberg Coll. differs from the worker in having ocelli and a typical female

thorax, though without traces of wing-insertions. The pro- and mesonotum and the scutellum are coarsely and umbilicately punctate like the head, and the basal portion of the first gastric segment is covered with coarse, sparse punctures in addition to the general fine and dense punctuation of the surface.

As Mayr pointed out, the genus *Bradoponera* is allied to *Proceratium*. It is still more closely related to *Discothyrea*, of which five species are known: *D. testacea* Roger of North America, *antarctica* Emery of New Zealand and *clavicornis* Emery of German New Guinea, *globus* Forel of Java and *oculata* Emery of Kamerun.

In this genus, however, the antennæ of the worker are 9- instead of 12-jointed, the eyes are minute and the frontal carinæ, clypeus and petiole have a different conformation. These differences show that *Bradoponera* is much more primitive than any of the recent genera of Proceratini. The workers of all of these genera, moreover, are hypogæic in their habits, whereas *B. meieri* was, in all probability, an epigæic or even arboreal species.

Tribe Ectatommini Emery.

Genus *Ectatomma* J. Smith.

Ectatomma (Rhytidoponera) europæum Mayr.

Ectatomma europæum Mayr, Beitr. Naturk. Preuss. I, 1868, p. 76, Taf. IV, Figs. 72, 73, ♀; Dalla Torre, Catalog. Hymen. VII, 1893, p. 24; Handlirsch, Foss. Insekt. 1908, p. 879.

Male (Fig. 5). Length 3,5—3,75 mm.

Head, including the mandibles longer than broad, with very large and prominent eyes and ocelli. Mandibles well-developed. Clypeus convex, with entire, subangular anterior border. Antennæ very long and slender, 13-jointed; scape more than twice as long as broad, first funicular joint half as long as the scape, remaining joints cylindrical, subequal, seven or eight times as long as broad. Mesonotum with well-marked Mayrian furrows. Epinotum in profile with subequal base and declivity forming an obtuse angle with each other. Petiole nearly twice as long as high; its node low and rounded posteriorly. First gastric segment with a small protuberance on its anteroventral margin. Genital appendages and pygidium short and rounded. Legs slender. Wings large and broad.

Head, gaster and much of the thoracic dorsum and petiole covered with a white air-film so that the sculpture cannot be clearly seen.

The surface seems to be smooth, however, except the epinotum and petiole, which are coarsely rugose. Gaster covered with scattered piligerous punctures.

Hairs rather abundant, investing the body and legs, suberect on the former, more reclinate on the latter. Pubescence on the antennæ long and conspicuous. Wings hairy.

Fig. 5. *Ectatomma europæum* MAYR. Male: Brussels Museum, 157.

Body black; legs dark brown; wings with pale brown veins and stigma.

Described from two well-preserved specimens, one (No. 157) in the Brussels Museum and one (without a number) in the Geolog. Inst. Koenigsberg Coll. There can be little doubt that they belong to this species, of which MAYR described the female from a single specimen in the MENGE Coll. There is another specimen of this sex (B 1309) in the Geolog. Inst. Koenigsberg Coll., but it is rather poorly preserved and in an unfortunate position, though it shows a great deal of the sculpture of the right side of the body. This sculpture agrees very well with MAYR's description. The worker phase is still unknown.

Genus *Electroponera*, gen. nov

A single worker specimen (B 18994) in the Geolog. Inst. Koenigsberg Coll. differs so greatly in general habitus from any Ponerine genera known to me that I am compelled to make it the type of a new genus and species, although the legs, gaster, front of the head and much of the remainder of the body are hidden in a very opaque white film. The block of amber containing the specimen has been mounted, moreover, in a large balsam cell, so that it is impossible to see much more than is represented in Fig. 6. *Ectatomma* seems to be the most nearly related genus. The head is subrectangular, with rather rounded sides and posterior angles and feebly excised posterior border. The mandibles are large and of the usual form, but their teeth, if they have any, cannot be seen. The frontal carinæ are appar-

ently dilated and overlap the insertions of the antennæ. They are 12-jointed. The eyes are of moderate size and placed further back than in most Ponerine genera. The pronotum has a distinct humeral tubercle on each side as in *Paraponera, Odontoponera* and some species of *Ectatomma.* The thorax is constricted in the mesoëpinotal region, and the mesonotum form a small convex plate in front of the constriction and extending forward in the median line between the postero-lateral portions of the pronotum. The epinotum bears a pair of blunt tubercles and has a rather flat base and a concave sloping declivity, which is bordered on each side by a distinct ridge continuous with the tubercle of the same side. The petiole has a concave anterior and a more flattened posterior declivity, both bordered by a sharp ridge on each side and meeting above in a transverse ridge at the summit of the node. Gaster with a distinct constriction between the first and second segments. Legs long.

Electroponera dubia, sp. nov.

Worker (Fig. 6). Length about 7,5 mm.

With the form described in the preceding paragraph. Antennal scapes reaching to the posterior corners of the head; basal funicular joints a little longer than broad, more distal joints as broad as long.

Surface apparently opaque; thorax and petiole with parallel series of rugæ, those on the pronotum concentric with the humeral tubercles, those on the mesopleuræ, sides of the epinotum and sides of the petiole sublongitudinal.

Hairs erect, abundant and rather long, especially on the head, pronotum and gaster; more reclinate on the legs and antennal scapes.

Color black.

Fig. 6. *Electroponera dubia* sp. nov. Worker, B 18994.

That this ant is quite distinct from any of the other species described from the amber is certain, but its exact position in the Ponerine subfamily can be determined only after the discovery of additional specimens. I have placed it provisionally in the tribe *Ectatommini.*

Tribe Platythyreini EMERY.

Genus *Platythyrea* ROGER.

Platythyrea primæva, sp. nov.

Worker (Fig. 7 a). Length about 5,5 mm.

Related to *P. wroughtoni* FOREL of India. Head distinctly longer than broad, subrectangular, with subparallel sides and rather rounded posterior angles. Clypeus and frontal carinæ of the usual conformation. Mandibles minutely denticulate.

Antennæ robust; scapes scarcely reaching beyond the posterior corners of the head; funicular joints 1—3 a little longer than broad, remaining joints, except the last, as broad as long. Thorax of the usual shape, prismatic, with parallel, flattened sides and flattened dorsum; promesonotal suture very distinct; mesoëpinotal suture obsolescent. Epinotum with a pair of blunt teeth; its declivity concave and marginate on the sides. Petiole longer than broad, in profile as high as long, shaped like that of *P. wroughtoni*, but with the median dorsal ridge more pronounced and terminating behind in a more prominent tooth-like projection. On each side of this there is a more rounded and smaller projection in the sharp posterior border of the segment. Gaster and legs of the usual shape.

Fig. 7. *Platythyrea primæva* sp. nov. a) Worker; b) Female K 5122.

Body enveloped in a white film, but its surface is evidently opaque as in many of the recent species. Sides of epinotum and of the petiole, and base of the first gastric segment, with coarse, scattered punctures. Pronotum and upper surface of the head somewhat more feebly punctate.

Hairs absent, except on the mandibles.

Body and appendages black.

Female (ergatoid?) (Fig. 7b). Length about 6 mm.

Resembling the worker. The ocelli are probably present but hidden by one of several air-bubbles which are scattered over the body. Eyes but little larger than those of the worker. Thorax rather stout, with distinct mesonotum, scutellum and metanotum, but with no clear indications of having borne wings. The epinotum and petiole resemble the corresponding parts of the worker. Surface of body opaque, its chitinous integument much decomposed. Hairs absent. Color deep black throughout.

Described from a single worker in the Geolog. Inst. Koenigsberg Coll. (no number) and a single female (K 5122) in the KLEBS Coll. The species is clearly very closely related to the living members of the genus *Platythyrea*, which has a wide distribution in the tropics of both hemispheres.

Tribe Ponerini FOREL.

Genus *Euponera* FOREL.

Euponera (Trachymesopus) succinea (MAYR).

Ponera succinea MAYR, Beitr. Naturk. Preuss. I, 1868, p. 72 ♀; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 42; HANDLIRSCH, Foss. Insekt. 1908, p. 879.

Female (Fig. 8a—c). Length about 6 mm, wings nearly 7 mm.

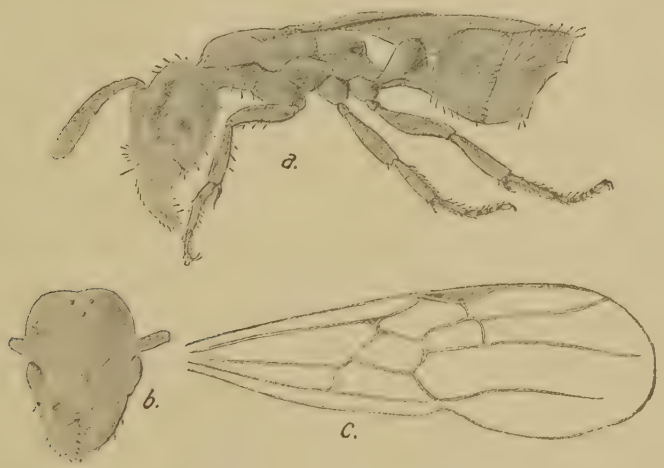

Fig. 8. *Euponera (Trachymesopus) succinea* (MAYR); a) Female in profile; b) head, from above; c) wing.

Head rectangular, a little longer than broad. Eyes rather large, anterior, slightly flattened. Ocelli well developed. Mandibles convex, with six large, subequal teeth. Clypeus with a strong longitudinal projection in the middle, its anterior border broadly rounded. Antennæ

robust, 12-jointed; scape not reaching the posterior corner of the head; all the funicular joints, except the first and last, distinctly broader than long. Thorax of the usual shape. Petiole as high as the epinotum, higher than long and about $1^1/_2$ times as broad as long; its anterior surface somewhat concave, its upper surface rounded and convex and passing through an obtuse angle into the flattened posterior declivity; the sides rounded. Gaster of the usual conformation. All the legs with pectinated spurs; middle and hind pairs each also with a pair of small simple spurs. Middle tibiæ and metatarsi short, with numerous stout bristles on their extensor surfaces.

Mandibles coarsely striato-punctate; head, thorax and petiole finely and densely punctate; gaster smooth, apparently.

Hairs long, suberect and scattered, rather uniformly distributed on the head, thorax and gaster; shorter, more abundant and appressed on the legs. Antennæ with only a few short, erect hairs near the bases and at the tips of the scapes.

Dark brown or black; legs somewhat reddish: wings yellowish, with brown veins and stigma.

This is evidently a true *Euponera* of the subgenus *Trachymesopus*, on account of the short and bristly middle tibia and metatarsus and the character of the spurs on the middle and hind tibiæ.

In addition to one of MAYR's types (No. 640/10 277) I have seen eighteen specimens from the Geolog. Inst. Koenigsberg Coll., namely, Nos. III B 250, B 5478, B 5064, B 19 074, B 18 632, B 19 093, B 5450, B 19 027, B 5222, B 5253, B 18 594 and seven without numbers; and three specimens from the KLEBS Coll., namely K 1094, X 11 and A 140. All the specimens bear wings and all are in amber of such similar color and texture, and are in such a uniform state of preservation, with more or less of the gaster, usually its tip, enveloped in large bubbles or masses of white substance, that I am inclined to believe that all came originally from the same locality and even formed part of the same nuptial flight.

Genus *Ponera* LATREILLE.

Ponera atavia MAYR.

Ponera atavia MAYR, Beitr. Naturk. Preuss. I, 1868, p. 72, Taf. IV, Figs. 66—69 ♀ ♂ DALLA TORRE, Catalog. Hymen. VII, 1893, p. 37; HANDLIRSCH, Foss. Insekt. 1908, p. 879.

Worker (Fig. 9a—c). Length about 3,6 mm.

Head rectangular, longer than broad, with evenly rounded sides and its posterior border feebly but distinctly excised in the middle.

Eyes minute and very near the anterior corners of the head. Mandibles with three or four larger apical and several very minute basal teeth. Clypeus moderately convex, its anterior border straight, except in the middle, where it has a slight, rounded projection. Antennæ slender; scapes not reaching beyond the posterior corners of the head; first funicular joint about three times as long as broad, joints 2—4 as long as broad, joints 5—10 distinctly longer than broad and gradually increasing in size; terminal joint large, nearly as long as the three preceding joints taken together. Thorax in profile nearly straight above, compressed laterally, especially in the meso- and metapleural region, broadest through the pronotum, which is somewhat longer than broad; mesonotum transversely elliptical, a little broader than long; meso-epinotal suture very distinct; base of epinotum submarginate on the sides about as long as the declivity, into which it passes through a rounded angle. Petiole as high and as broad as the epinotum, in profile with straight and perpendicular anterior and posterior surfaces and evenly rounded node. First gastric segment somewhat narrower than the second. Legs of the usual shape.

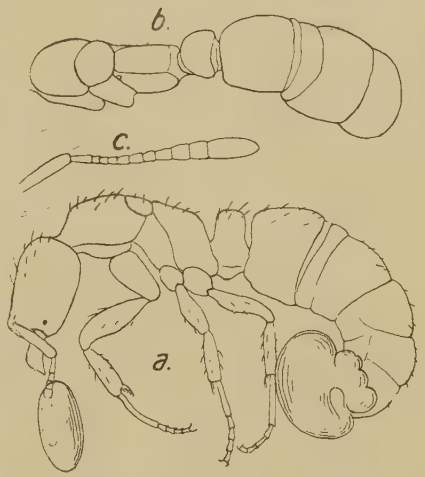

Fig. 9. *Ponera atavia* Mayr.
a) Worker in profile; b) dorsal view of same; c) antenna.

Body finely punctate-rugulose and shining, the punctures on the gaster very fine and more superficial than those on the head and thorax.

Body and legs with sparse, suberect hairs, most distinct on the dorsal surface of the former, shorter and more reclinate on the latter. The head seems to be covered with short pubescence.

Black; gaster more reddish, especially the sides and ventral portion of the first segment.

Described from a single, well-preserved specimen, without a number, in the Geolog. Inst. Koenigsberg Coll. There can be little doubt that this is the worker of the species which was based by Mayr on male and female specimens only. This worker shows that *P. atavia* is distinct from the living *P. coarctata*. Concerning the former Mayr said: „Diese Art, besonders aber das Weibchen, stimmt mit der jetzt lebenden *Ponera contracta* Latr. so sehr überein, daß ich nicht imstande bin,

ein erhebliches Merkmal anzugeben, wodurch beide Arten von einander zu trennen wären, obschon ich andererseits nicht behaupten möchte, daß beide gar nicht von einander abweichen." Comparison of the worker *atavia* with that of *coarctata* shows that the latter has a longer head, with the eyes placed further back and the antennæ with much shorter basal funicular joints; the mesonotum is of a different shape, the epinotum shorter and the sides of its base are not marginate. In certain particulars, especially in the structure of the thorax and antennæ, the amber *Ponera* resembles much more closely *P. confinis* ROGER of India, Burma and Sumatra and *P. eduardi* FOREL of the Mediterranean region. MAYR called attention to the fact that the male of *P. atavia* is unlike that of *P. coarctata* in possessing MAYRian furrows on the mesonotum.

In addition to the worker specimen described above I have examined the following females in the Geolog. Inst. Koenigsberg Coll.: No. 203/3855 (MAYR's type), 103/14, B 18331, and three specimens without numbers; the following males: 621/10108 (MAYR's type), B 4502, B 18442, XXB 48, B 18460, XXB 2139, B 19815, XXB 1598, □B 247, and nine specimens without numbers, and five males in the KLEBS Coll.: K 3537, K 5252, K 5238, K 7530 and K 5173, the last comprising two specimens in the same block of amber. Thus I have seen twenty-nine specimens of this species, including the worker. The female specimen B 18331 is embedded with a small worker of *Lasius schiefferdeckeri* MAYR.

Ponerinæ incertæ sedis.

Ponera gracilicornis MAYR.

MAYR, Beitr. Naturk. Preuss. I, 1868, p. 72, nota, ☿; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 39; HANDLIRSCH, Foss. Insekt. 1908, p. 879.

MAYR's description of this species based on a single worker specimen from the MENGE Coll., is too brief to admit of the determination of the genus to which it belongs. That it is not a *Ponera* is show by its great size (10,5 mm). I am unable to recognize it among the material sent me by Professors KLEBS and TORNQUIST.

Subfamily Myrmicinæ MAYR.

Tribe Pseudomyrmini EMERY.

Genus *Sima* ROGER.

The occurrence of five species of this genus in the Baltic amber is of unusual interest, as all the living members of the genus are

confined to the Old World tropics. The ocelli had already disappeared in the workers of three of the Baltic species, and four of the species are very closely related to the slender, black, recent forms of India, Africa and Madagascar.

Sima klebsi, sp. nov.

Worker (Fig. 10). Length 8,5 mm.

Head somewhat longer than broad, elliptical, with rounded sides and feebly excised posterior border. Eyes flat, in the middle of the

Fig. 10. *Sima klebsi* sp. nov. Worker, X 8.

sides of the head. Ocelli present. Mandibles convex, 5-toothed, with their masticatory border broader than the base. Clypeus short, obtusely bidentate. Antennæ small; scapes reaching backward only to the middle of the head; first funicular joint as long as the two succeeding joints together; joints 3—6 broader than long, remaining joints as broad as long. Pro- and mesonotum somewhat broader than long, flattened above; mesoëpinotal constriction distinct. Epinotum longer than broad, feebly rounded above and behind. Petiole longer than broad, laterally compressed, distinctly pedunculate, with evenly rounded node and concave lower surface. Postpetiole apparently longer than broad, pedunculate, its convex upper surface rather suddenly declivous

just in front of its articulation with the first gastric segment. Gaster and legs of the usual shape.

Mandibles coarsely striato-punctate. Head opaque, finely reticulate punctate; the cheeks indistinctly longitudinally rugose in front. Pronotum with coarse, arcuate rugæ, concentric with its hind margin; mesonotum, mesopleuræ, base and sides of epinotum more finely longitudinally rugose; the rugæ on the epinotal declivity being transverse and continuous with the longitudinal rugæ on the sides. Petiole coarsely longitudinally rugose. Postpetiole and gaster smooth and shining.

Hairs sparse, erect; most conspicuous on the mandibles, clypeus, upper surface of the body and lower and apical surfaces of the gaster; sparser and less conspicuous on the legs.

Color black; covered in great part with a silvery air-film.

Described from a single specimen (X 8) in the KLEBS Coll.

This species may be readily distinguished from all the other amber species by its beautiful sculpture and from all except *S. ocellata* MAYR by possessing ocelli.

Sima ocellata MAYR.

Sima ocellata MAYR, Beitr. Naturk. Preuss. I, 1868, p. 101, Taf. V, Figs. 104, 105, ♀; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 54; HANDLIRSCH, Foss. Insekt. 1908, p. 872.

This is the largest of the species of *Sima* described by MAYR, the worker measuring 7,2—9,4 mm. Like the preceding it possesses ocelli. The first funicular joint of the antennæ is shorter than the second and third joints together.

I have seen only two specimens, MAYR's type (No. 204 3856) in the Geolog. Inst. Koenigsberg Coll. and one, without a number, but labelled „*Myrmica* VON BRONSART" in the Berlin Museum. The latter specimen measures only 6 mm and is in the midst of a brown cloud. The three ocelli, however, are very distinct.

Sima simplex MAYR. (Fig. 11.)

Sima simplex MAYR, Beitr. Naturk. Preuss. I, 1868, p. 102, ♀; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 55; HANDLIRSCH, Foss. Insekt. 1908, p. 872.

Two workers in the KLEBS Coll. (K. 944 and K. 929) are 6 mm in length and agree very closely with MAYR's description of this species, which is characterized by the absence of ocelli, in having the mandibles broader at the masticatory border than at the base, and in having the first funicular joint of the antennæ shorter than the two succeeding

joints together. The head and pronotum are rather densely, the epinotum very densely punctate. All of these characters are well shown in the two specimens, except the mandibles, which are tightly closed and in an unfavorable position. Both specimens are black, with the surface more or less obscured by a silvery air-film, and both show long, sparse, suberect hairs on the gaster. One of the specimens has the long sting exserted. Two additional specimens in the Geolog. Inst. Koenigsberg Coll. (No. 638/10245 and one without a number) each measure about 5,5 mm. and are in an excellent state of preservation.

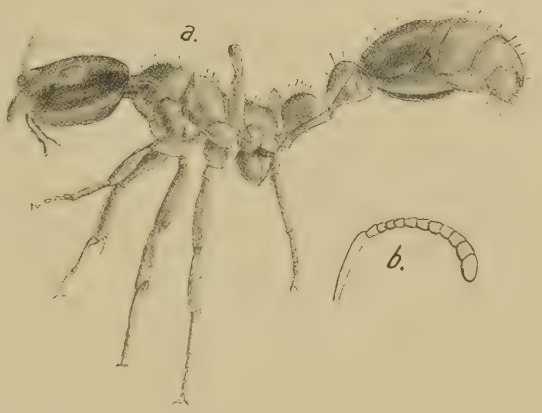

Fig. 11. *Sima simplex* Mayr. a) Worker; b) antenna.

Sima angustata Mayr. (Fig. 12.)

Sima angustata Mayr, Beitr. Naturk. Preuss. I, 1868, p. 102, Pl. V, Fig. 106, ☿; Dalla Torre, Catalog. Hymen. VII, 1893, p. 53; Handlirsch, Foss. Insekt. 1908, p. 872.

This is a smaller and more slender species than the preceding, measuring only 3,5—6 mm. It also lacks ocelli. The mandibles are somewhat narrower at the masticatory border than through the base, the first funicular joint of the antennæ is longer than the two succeeding joints together and the punctuation of the head and thorax are somewhat sparser.

Fig. 12. *Sima angustata* Mayr. Worker XXB 29.

I have seen ten workers which agree with Mayr's description, two from the Klebs Coll. (K. 817 and K. 794) and eight from the Geolog. Inst. Koenigsberg Coll, namely: No. 319/7605 (Mayr's type), XXB 29, XXB 4164, B 261, XXB 1048, B 18545 and two without a number. The

variation in size of these specimens (5—6 mm.) is so great as to suggest that they may include several closely related species.

Sima lacrimarum, sp. nov.

Worker (Fig. 13). Length about 3 mm.

Head longer than broad, subrectangular, with rounded posterior corners and eyes in front of the middle. Ocelli absent. Antennal scapes curved; first funicular joint as long as the three preceding joints together, joints 5—7 broader than long, joints 8—10 nearly as long as broad. Pro- and mesonotum feebly convex, mesoëpinotal constriction distinct. Epinotum short, as high as long, convex and rounded, without distinct base and declivity. Petiole and postpetiole each longer than broad, with a short peduncle and the node rounded above and somewhat abruptly truncated behind. Gaster and legs of the usual conformation.

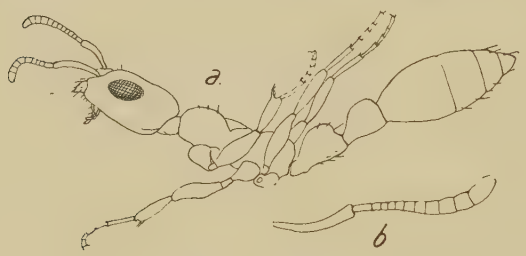

Fig. 13. *Sima lacrimarum* sp. nov.
a) Worker, b) antenna enlarged.

Surface of body smooth and shining, apparently with small, sparse, piligerous punctures.

Hairs sparse, erect, most noticeable on the clypeus, mandibles, palpi and tip of gaster.

Color deep reddish brown.

Described from a single well-preserved specimen (X 2) in the KLEBS Coll.

This species appears to be closely related to *S. angustata*, but I have described it as distinct, on account of its very small size, the larger and more anteriorly placed eyes and the shortness of joints 2—5 of the funiculus.

Among recent species which are closely related to *S. angustata, simplex* and *lacrimarum* may be mentioned the Indian *S. nigra* ROGER, *compressa* ROGER, *allaborans* WALKER, *difficilis* FOREL and *binghami* FOREL, the Australian *S. leviceps* F. SMITH and the Madagascarene *S. rakotonis* FOREL and *S. hysterica* FOREL.

Tribe Monomoriini, trib. nov.

Genus ***Monomorium*** Mayr.

Monomorium pilipes Mayr. (Fig. 14.)

Monomorium pilipes Mayr, Beitr. Naturk. Preuss. I, 1868, p. 91, Taf. V, Figs. 93, 94, ☿; Dalla Torre, Catalog. Hymen. VII, 1893, p. 69; Ern. André, Bull. Soc. Zool. France, XX, 1895, p. 82; Handlirsch, Foss. Insekt. 1908, p. 872.

Twenty two workers of this species, all in the Geolog. Inst. Koenigsberg Coll., have been examined, namely: No. 137/3789 (seen by Mayr and doubtfully referred to this species), XXB 2168, XXB 813, XXB 1550, XX 1897, XIII B 3000, B 5338, B 19461, B 304, B 19401, B 251, B 5367, B 18477 and nine without numbers.

The mandibles have 5 subequal teeth; the mesoëpinotal constriction is pronounced, the epinotum subangular in profile, with subequal base and declivity, the former feebly convex, the latter sloping and slightly concave. Antennæ 12-jointed. The petiole has a well-developed, rounded and anteroposteriorly compressed node and a distinct peduncle. The postpetiole is lower and more rounded than the petiolar node. The mesopleuræ and epinotum are longitudinally rugulose, the remainder of the body smooth and shining, with scattered piligerous punctures, which are most distinct on the head and gaster. Most of the specimens are brown or reddish throughout, a few, which are more decomposed, are black. Length 2—2,5 mm.

Fig. 14.
Monomorium pilipes Mayr. Worker.

Mayr states that this species is most closely related to the living *M. destructor* Jerdon (= *M. basale* F. Smith), an originally paleotropical ant now common also in neotropical countries. *M. destructor*, however, has a much more slender thorax, petiole, postpetiole, antennæ and legs than *M. pilipes*.

Monomorium mayrianum, nom. nov. (Fig. 15.)

Lampromyrmex gracillimus Mayr, Beitr. Naturk. Preuss. I, 1868, p. 95, Taf. V, Figs. 97, 98, ☿; Dalla Torre, Catalog. Hymen. VII, 1893, p. 78; Handlirsch, Foss. Insekt. 1908, p. 873.

This form unquestionably belongs to the genus *Monomorium* as at present defined. Mayr was apparently induced by the 11-jointed

antennæ to establish an independent genus for its reception, but although *Monomorium* is made up very largely of species with 12-jointed antennæ in the worker and female phases, a few of the species (*M. orientale* MAYR and *M. atomus* FOREL) have 11-jointed and one (*M. decamerum* EMERY) even has 10-jointed antennæ. As the name *gracillimum* is preoccupied in the genus *Monomorium* by a species described by F. SMITH in 1861, it becomes necessary to give the amber species a new name.

Fig. 15. *Monomorium mayrianum* nom. nov. Worker B 252.

19 workers in the Geolog. Inst. Koenigsberg Coll. are referable to this form, namely: No. 84/3736, No. 110/3762 (MAYR's type), B 252, B 18665, B 18880, B 14742, XX B 301, B 19191, B 19998 (two workers in one block), XXB 607, XXB 594, XXB 1054, and six without numbers. One of the numbered specimens is in the same block as a worker of *Iridomyrmex geinitzi* MAYR. There are also five workers in the KLEBS Coll. namely K 4274, K 4269, K 1031, K 948 and K 2646.

M. mayrianum is very similar to *M. pilipes,* but besides having 11-jointed antennæ, it is smaller (1,5—1,8 mm), the mesoëpinotal constriction is less pronounced, the epinotum is less angular, with a more rounded and convex base and the petiolar node seems to be less compressed antero-posteriorly and of about the same size and shape when seen from above as the postpetiole. The sculpture, pilosity and color are very much like those of *M. pilipes.*

Tribe Solenopsidiini EMERY.

Genus *Erebomyrma* WHEELER.

Erebomyrma antiqua (MAYR).

Pheidologeton antiquus MAYR, Beitr. Naturk. Preuss. I, 1868, p. 93, Taf. V, Fig. 95, 96, ♀.

Aëromyrma antiqua EMERY, Mem. Accad. Sci. Bologna (5) I, 1891, p. 577 ♀; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 78; HANDLIRSCH, Foss. Insekt. 1908, p. 872.

Aëromyrma sp. WHEELER, Ants, their Structure, Development and Behavior, 1910, p. 163, Fig. 92, ♂.

Worker (Fig. 16a and b). Length about 2 mm.

Closely resembling the worker of *E. longi* WHEELER in shape. Head rather large, subrectangular, somewhat longer than broad.

Mandibles with oblique, dentate blades. Eyes vestigial. Antennæ 11-jointed; excluding the mandibles. First funicular joint fully as long as the three succeeding joints together; joints 2—8 narrow, as long as broad; club 2-jointed, its basal joint about one third as long

Fig. 16. *Erebomyrma antiqua* MAYR. a) Worker, B 19926; b) Worker, B 243; c) Female, B 437; d) Male K 1029.

as the enlarged terminal joint. Mesoëpinotal constriction distinct. Epinotum armed with two small acute and distinctly recurved teeth. Petiole large, longer than high, its ventral portion convex in profile and laterally compressed, its node with long, concave anterior and shorter, nearly straight posterior declivity. Postpetiole small, subglobular constricted posteriorly. Gaster large, elliptical, with small, concealed terminal segments, like those of *E. longi*. Legs long, with clavate femora and tibiæ.

Surface of body and appendages smooth and shining, with very sparse and indistinct, piligerous punctures. Mesopleuræ and epinotum densely and coarsely, sides of petiole more finely punctate; this sculpture closely resembling that of *E. longi.*

Hairs slender and sparse, suberect on the body, shorter and more reclinate on the legs and antennal scapes.

Color reddish brown throughout.

Female (Fig. 16c). Length about 5,5—6,5 mm.

Head nearly as broad as long, subrectangular, convex, with well-developed, toothed mandibles. Antennæ small, similar to those of the worker. Eyes and ocelli moderately large. Thorax robust, somewhat longer than high, with short, stout, recurved epinotal spines. Petiole in profile with a rather acute node, which has both its anterior and posterior declivities concave and of about the same length. There is a stout, laterally compressed tooth at the anteroventral end of the petiole. Postpetiole short, higher than long, convex above. Gaster large, elliptical. Middle and hind tibiæ with well-developed spurs. Wings large, with single cubital, radial and discal cell. The radial cell is elongate and closed as the anterior branch of the cubital vein unites with the costa. The discal cell is large and trapezoidal owing to the recurrent vein not being parallel with the basal. The second branch of the cubital vein comes off a little beyond the middle of the cubital cell. Apterostigma well-developed.

Mandibles with scattered punctures. Sculpture of head, thorax, petiole and postpetiole apparently very much as in the female of *E. longi.*

Hairs slender, erect and abundant on the body, sparser and more reclinate on the appendages. Wings covered with minute hairs.

Body black; legs brownish; wings brown with darker veins and stigma.

Male (Fig. 16d). Length about 5 mm.

Head apparently as broad as long, with rounded posterior corners and very large and prominent eyes and ocelli, the eyes situated far forward, so that the cheeks are extremely short. Mandibles small but overlapping and dentate, with acute tips. Clypeus with its anterior border angularly projecting in the middle. Antennæ slender, 13-jointed, about as long as the head, thorax and pedicel; scape slightly thicker than the funiculus, about twice as long as broad; first funicular joint not enlarged or globose, somewhat longer than broad, second joint longer than the scape and any of the succeeding joints, which are subequal and cylindrical. Thorax with prominent, rounded mesonotum,

overarching the pronotum and without Mayrian furrows. Epinotum rounded, slightly convex, without distinct basal and declivous surfaces, sloping, with two faint parallel ridges in the place of teeth. Petiole and postpetiole in profile each about as high as long, with low, rounded nodes; the petiole with an anteroventral tooth, the postpetiole broad behind and not constricted where it is attached to the gaster. Gaster pointed at the tip, with small genital appendages exactly like those of the male *E. longi* in shape. Legs slender. Wings broad and ample (4,4 mm. long); venation like that of the female.

Surface of body and appendages apparently smooth.

Hairs slender, short, suberect, covering the body but absent on the legs. Wings minutely hairy

Dark golden brown; head and thorax largely blackish; legs and gaster yellowish. Wings colored like those of the female.

Described from the following specimens:

Three workers in the Geolog. Inst. Koenigsberg Coll., two in a single block of amber (B 243) containing also a small fly *(Phora loewi* Brues; type), a few small Collembola, some fragments of wood (?) and many bubbles. A fourth worker (B 19926) is in a clear piece of amber.

Two females in the Geolog. Inst. Koenigsberg Coll., No. 447/7733 (Mayr's type), measuring about 5,5 mm and one (without a number) measuring about 6,5 mm.

Three males, one in the Geolog. Inst. Koenigsberg Coll. (without a number) and two in the Klebs Coll. (K 1029 and K 4523). The description of the male is drawn from K 1029.

Mayr referred this species, which he based on three female specimens, to *Pheidologeton,* though he was aware that it differed from the living members of this genus in its much smaller size. The other differences, which he mentions, such as the dentition of the mandibles and the venation of the wings, I find from an examination of specimens of *Ph. diversus* and *affinis* in my collection, to be less important than he supposed, so that he is not to be blamed for his generic diagnosis. Emery, however, in connection with his description of a male ant which he found in the Sicilian amber and called *Aëromyrma sophiæ,* stated that Mayr's *Pheidologeton antiquus* „appartiene senza dubio allo stesso genere", so that later writers have called it *A. antiqua.* The discovery of the worker described above makes the generic affinities of this species perfectly clear, for this phase agrees so closely with the worker of *E. longi* that the two species are almost indistinguishable except by the small epinotal teeth, which are more acute and

recurved in the amber form. Moreover, the worker *E. antiqua* bears the same relation in size to MAYR's type specimen and the male described above, as does the worker *E. longi* to its female and male. I believe, therefore, that I cannot be mistaken in my generic diagnosis.

E. antiqua, as we must now call the species, acquires a peculiar interest from the fact that hitherto only two species of the genus have been described, one (*E. longi*) from Texas, and the other (*E. peruviana* EMERY), from Peru. Only the female of the latter has been seen. Since no species of the genus has been described from the Old World, it would be easy to jump to the conclusion that we have here a striking resemblance between amber and neotropical forms, but this, in my opinion, would be premature, for the recent *Erebomyrma* seem to be very rare ants, and it is not at all improbable that living species may yet be discovered in the tropics of the Old World. The discovery of species in such widely separated localities as Texas, Peru and the Baltic region proves, nevertheless, that the genus was once cosmopolitan.

E. antiqua is interesting also from an ethological standpoint. Its pale, diminitive workers, with their vestigial eyes, show very clearly that it was a hypogæic ant, the large, pigmented sexual forms of which appeared above the surface of the ground only for their nuptial flight. EMERY, FOREL and others have shown that several species of the allied genera *Aëromyrma*, *Carebara* and *Diplomorium* in the Old World, of *Tranopelta* in the New World, and of *Solenopsis* in both hemispheres live as thief-ants in the nests of other Formicidæ and of termites. As the type specimens of *E. longi* were taken near termite nests by Mr. W. H. LONG, and as termites are known from the amber, we may safely infer that in its habits *E. antiqua* closely resembled its living Texan congener. Social symbiosis and parasitism in ants, therefore, are not necessarily recent acquisitions but may date from the early Tertiary or even from the Mesozoic.

The very small size of the worker of *E. antiqua* as compared with the male and female would seem to indicate that the species once possessed polymorphic workers like *Pheidologeton*, *Oligomyrmex*, *Aëromyrma* and a few species of *Solenopsis*, but had already lost all but the smallest caste of these sterile forms during Oligocene times. If this view of the origin of the discrepancy in size between the workers and queens, which is held by EMERY, is correct, the hypothesis which I advanced in a former paper (1908) to the effect that the polymorphism of the worker caste is of more recent origin than the Oligocene, will have to be abandoned.

Tribe Myrmicini Emery.

Genus *Vollenhovia* Mayr.

Vollenhovia beyrichi (Mayr).

Macromischa beyrichi Mayr, Beitr. Naturk. Preuss. I, 1868, p. 84, Figs. 80, 81 ☿; *Propodomyrma samlandica* Wheeler, Ants, Their Structure etc. 1910, p. 163. Fig. 93 ☿.

Worker (Fig. 17). Length 4 mm.

Head, excluding the mandibles, but little longer than broad, subrectangular, with straight posterior border and rather straight sides. Eyes moderately large, somewhat flattened, near the middle of the sides. Mandibles 5-toothed; the two apical teeth largest; basal tooth prominent. Clypeus short and broad, convex in the middle, depressed on the sides, its anterior border with a faint but distinct median sinuosity. Antennal foveæ large. Frontal area small, triangular. Frontal carinæ short. Antennæ rather stout, 12-jointed; scapes not reaching to the posterior corners of the head; funiculus terminating in a 3-jointed club which is distinctly shorter than the remainder of the funiculus; first funicular joint as long as the two succeeding joints together; joints 2—7 broader than long, joint 8 as long as broad, terminal joint as long as the two preceding subequal joints of the club. Thorax stout, somewhat narrower behind than in front; pronotum with prominent transverse anterior portion rising abruptly above the neck; humeri prominent though rounded. Mesoëpinotal constriction faint, especially on the dorsal side, so that the surface of the mesonotum and base of the epinotum in profile form a nearly continuous horizontal line. Epinotum armed with two teeth which are longer than broad at their bases, as long as far apart, somewhat blunted at their tips and directed backward and slightly outward and upward. Epinotal base and declivity subequal, meeting at nearly a right angle, the declivity concave, the metasternal angle rounded. Petiole from above twice as long as broad, with subparallel sides, a little narrower in front than behind, in profile with a short peduncle and a prominent anteromedian ventral tooth; node rather high and angular, with subequal anterior and posterior slopes, the former concave, the latter convex above and concave near the border of the postpetiole. Postpetiole a little broader

Fig. 17. *Vollenhovia beyrichi* Mayr. Worker, K 904.

than the petiole, nearly as long as broad, with rounded anterior corners and straight subparallel sides, not constricted behind; in profile it is rounded above and somewhat flattened below. Gaster regularly elliptical, not truncated in front, nearly as large as the head. Legs very stout; tibiæ and especially the femora incrassated; middle and hind tibiæ without spurs.

Mandibles rather coarsely striato-punctate. Head longitudinally rugose, with two smooth bands extending from the antennal fovea nearly to the posterior border and foreshadowing scrobe-like depressions for the antennal scapes. Thorax, petiole and postpetiole longitudinally rugose, but more irregularly and vermiculately than the head. Gaster and legs smooth.

Hairs short, slender, erect, moderately abundant both on the body and legs.

Color black or deep reddish brown throughout.

I had not seen MAYR's type of this ant when I published the figure of *Propodomyrma samlandica* in my book and was misled by MAYR's figure (Pl. IV Fig. 80), which is far from being an adequate drawing of this species, as the petiole and thorax are incorrectly represented and the incrassation of the femora and tibiae is not shown. In the figure of the antenna (Fig. 81), moreover, the 3-jointed club is not distinctly marked off as it is in the specimen. MAYR was in error in placing the species in the genus *Macromischa*. It evidently belongs in the group of paleotropical genera comprising *Vollenhovia*, *Podomyrma*, *Stereomyrmex*, *Dacryon* and *Atopomyrmex*, and seems to be most readily assignable to *Vollenhovia*, especially as this genus is known to contain at least one recent species (*V. emeryi* WHEELER of Japan) with dentate epinotum.

Described from three specimens, the type (No. 198/3850), an unnumbered specimen in the Geolog. Inst. Koenigsberg Coll., and a beautifully preserved specimen (K 904) in the KLEBS Coll. All are in an admirable position, the last being red, the former black in color with the sculpture very distinct. The figure is drawn from KLEBS' specimen.

Vollenhovia prisca (ERN. ANDRÉ).

Macromischa? prisca ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 83 ♀; HANDLIRSCH, Foss. Insekt. 1908, p. 876.

The species described by ERN. ANDRÉ as *Macromischa? prisca* appears to be very similar to *V. beyrichi*. It is, however, somewhat larger (4,5 mm) and has 11-jointed antennæ. The club is 3-jointed, but longer than the remainder of the funiculus and joints 6 and 7 are as long

as broad. The mesoëpinotal constriction is feeble and the shape of the pedicel, gaster and legs seems to be much as in *beyrichi*, judging from the description. The femora, too, are strongly clavate, and the middle and hind tibiæ probably have no spurs. That this species cannot be placed in the West Indian genus *Macromischa*, as at present defined, is certain.

I have placed it provisionally in *Vollenhovia*, notwithstanding its 11-jointed antennæ. This character would carry it into the genus *Podomyrma*, but the thorax is too simple and too unlike that of any of the living species of this group with which I am acquainted.

Genus ***Stenamma*** Mayr.

Stenamma berendti (Mayr).

Aphænogaster berendti Mayr, Beitr. Naturk. Preuss. I, 1868, p. 82, Taf. IV, Figs. 78 79, ♂; Dalla Torre, Catalog. Hymen. VII, 1893, p. 100; Handlirsch, Foss. Insekt., 1908, p. 874.

Mayr described this species from a single male specimen in the Berendt Coll. I have found another male, which agrees very closely with his description, in the Geolog. Inst. Koenigsberg Coll. (no number). The small size of these specimens (2,2—2,5 mm) and their venation show that they belong to the genus *Stenamma* and not to *Aphænogaster*. Mayr supposed the venation of his specimen to be anomalous, but we now know that a single cubital cell is characteristic of *Stenamma*, whereas *Aphænogaster* has two cubital cells. Curiously enough, the venation of *S. berendti* is like that of our North American *S. brevicorne* Mayr and not like that of the European *S. westwoodi* Westw., in that the posterior branch of the cubital vein comes off near the middle of the cubital cell and not from the base of the radial cell. Mayr describes the Mayrian furrows of the thorax as absent in *S. berendti*, but in the specimen before me they are present, though not very deep. In Mayr's Fig. 78 the eyes are too small. The body of the specimen from the Geolog. Inst. Koenigsberg Coll. is black, the legs and gaster are brownish, the wings are pale brown with concolorous veins.

Genus ***Aphænogaster*** Mayr.

Aphænogaster sommerfeldti Mayr. (Fig. 18.)

Aphænogaster sommerfeldti Mayr, Beitr. Naturk. Preuss. I, 1868, p. 81, Taf. IV, Figs. 76, 77 ☿; Dalla Torre, Catalog. Hymen. VII, 1893, p. 104; Ern. André, Bull. Soc. Zool. France, XX, 1895, p. 82; Handlirsch, Foss. Insekt. 1908, p. 874.

This species, as Mayr observed, is allied to the recent *Aphænogaster subterranea* of the warmer portions of Europe. It resembles

the latter in form, size and sculpture, but the epinotal spines are somewhat more erect, the head is more slender, with less prominent posterior corners and the scapes and funicular joints of the antennæ seem to be more slender. The head behind is not as smooth as in *A. subterranea,* but covered with a wide mesh-work of rugæ.

Fig. 18. *Aphænogaster sommerfeldti* MAYR. Worker, K 4840.

I have seen 14 workers of this species from the Geolog. Inst. Koenigsberg Coll., namely: No. 377/7663 and 606/10092 (MAYR's types), B 19363, B 245, B 18727, B 18863, III B 249, B 250, XX B 921, B 239, B 18590, XIII B 305, XXB 921, XB 557, one without a number, and three from the KLEBS Coll., namely, K 36, K 3533 and K 4840.

Aphænogaster oligocenica, sp. nov.

Worker (Fig. 19). Length about 4,5 mm.

Closely resembling the preceding but differing in sculpture and in the armature of the epinotum. The latter is provided with two blunt projections instead of teeth, the epinotal declivity is sloping and the mesonotum is not raised in front in the form of a slight abrupt convexity as in *sommerfeldti* and many of the recent forms. The head is coarsely rugose, the rugæ being more parallel in front of and more reticulate behind the eyes. The longitudinal rugæ on the sides of the thorax, especially on the epinotum, are strong and further apart. The nodes of the petiole and postpetiole seem to be lower than in *sommerfeldti.* The gaster is rather large. The legs are long and slender. Color and pilosity much as in *sommerfeldti.*

Fig. 19. *Aphaenogaster oligocenica,* sp.nov. Worker, B 5461.

Described from a single specimen (B 5461) in the Geolog. Inst. Koenigsberg Coll. Though the amber is much cracked this specimen is well-preserved and most of its characters are clearly visible. Another specimen, B 18570, probably belongs to this species but is too densely enveloped in a white film to be identified with certainty.

Aphænogaster mersa, sp. nov.

Worker (Fig. 20). Length about 5,5 mm.

Differing from *A. sommerfeldti* in the following characters: The anterior border of the mesonotum does not project above the pronotum and the epinotal teeth are broader and blunter. The head and thorax and perhaps also the petiole and postpetiole are very coarsely reticulate rugose, and not longitudinally rugose, except on the front of the head.

Fig. 20. *Aphaenogaster mersa,* sp. nov. Worker, B 18509.

This species is based on a single specimen (B 18509) in the Geolog. Inst. Koenigsberg Coll. This specimen, though in a small piece of amber, is not very clearly visible, owing to a thick white film which envelops the whole left side of the body and the whole gaster, and a crack which obscures the anterior portion of the head.

Genus ***Electromyrmex,*** gen. nov.

Worker. Body slender. Head rather large, longer than broad, narrowed and depressed behind, with prominent occipital margin and large, convex eyes, situated in front of the middle and very near the anterior border, so that the cheeks are extremely short. Ocelli absent. Clypeus very short, extending back between the short and indistinct frontal carinæ. Frontal area obsolete. Mandibles very long, narrow, sublinear, with concave external border near the base and with distinct masticatory and basal borders the former straight and minutely and uniformly denticulate throughout its length. Antennæ slender, 12-jointed, with all the funicular joints longer than broad, the terminal ones not forming a distinct club. Thorax narrower than the head, prothorax greatly elongated, especially in front, where it tapers to form a slender neck, not distinctly marked off from the humeri. Mesonotum short and narrow; mesoëpinotal constriction distinct. Epinotum nearly as long as the pronotum but higher, with the base convex and longer than the concave declivity, and armed with two small, erect spines. Petiole slender, cylindrical, with only a faint indication of a node above, not dentate beneath. Postpetiole

shorter and somewhat broader than the petiole, convex above and constricted behind. Gaster about as large as the head, with very large first segment into which the remaining segments are withdrawn. Legs long, femora somewhat incrassated; middle and hind tibiæ without spurs.

Electromyrmex klebsi WHEELER.

Electromyrmex Klebsi WEEHLER, Ants, Their Structure, etc. 1910, p. 164, Fig. 94, ☿.

Worker (Fig. 21). Length about 5,5 mm.

Mandibles, clypeus, pronotum, gaster and legs apparently smooth and shining; head with sharp, longitudinal rugæ running its entire length; mesopleuræ and epinotum regularly and transversely, petiole and postpetiole longitudinally rugose.

Fig. 21. *Electromyrmex klebsi* WHEELER. Worker. K 2658.

Hairs short, sparse and erect on the body and mandibles, apparently absent on the scapes and gaster.

Color black throughout, more or less of the surface with a silvery luster.

Described from a single specimen (K. 2658) in the KLEBS Coll.

This singular ant is so unlike any of the recent species known to me in the structure of its mandibles, thorax and petiole that it evidently deserves to rank as the type of a new genus. The specimen has the tip of the gaster involved in a white cloud and much of the sculpture on one side is obscured by bubbles and air films, but the main characters are sufficiently distinct. The large, anteriorly placed eyes and the slender body and appendages indicate that the insect was an exquisitely arboreal form like the recent species of *Sima* and *Pseudomyrma*.

Genus *Agrœcomyrmex*, gen. nov.

Worker. Body short and thickset. Head subrectangular, scarcely longer than broad, slightly broader behind than in front, with rounded sides and posterior angles and small, very convex eyes placed very near the posterior angles, and deep antennal scrobes running from the antennal foveæ to the inner border of the eyes. Ocelli absent. Mandibles, short, convex, with 5 subequal teeth. Clypeus

about as long as broad, moderately convex, with nearly straight, entire anterior border. Frontal area large and distinct, triangular. Frontal carinæ short, each continued back into the mesial border of one of the antennal scrobes. Antennæ long and robust, 12-jointed, with a 3-jointed club; first funicular joint nearly as long as broad, joints 2—8 much broader than long, joints 9 and 10 a little broader than long, terminal joint large, glandiform, as long as the two preceding joints taken together. Thorax scarcely longer than the head and distinctly narrower, somewhat broader in front than behind, with rounded humeri and convex, rounded pro- and mesonotum and without traces of pro- and mesonotal and mesoëpinotal sutures. Epinotum in profile with subequal base and declivity, the former slightly flattened, the latter concave, armed with a pair of short, erect teeth which are about as long as broad at their bases and further apart than long. Metasternal angles sharp and erect, forming a pair of teeth somewhat smaller than those of the epinotum. Petiole and postpetiole short, compact and convex above, the former about as broad as long, without a distinct peduncle but with a well-developed anteromedian ventral tooth, the latter nearly twice as broad as the petiole, fully twice as broad as long and but little narrower than the first gastric segment, which is very convex above, hemispherical, and with the terminal segments forming a pointed cone, which is directed forward and downward. Legs robust; middle and hind tibiæ with well-developed, pectinated spurs.

Female. Resembling the worker but larger and with the typical structure of the female thorax, which is very short and compact, with well-developed, blunt teeth on the epinotum and compressed, pointed metasternal angles. The petiole, post-petiole and gaster resemble the corresponding parts of the worker. Wings with a discal and two cubital cells. Genotype: *Myrmica duisburgi* Mayr.

Agrœcomyrmex duisburgi (Mayr).

Myrmica duisburgi Mayr, Beitr. Naturk. Preuss. I, 1868, p. 87; Taf. V, Figs. 87, 88, ♀; Dalla Torre, Catalog. Hymen. VII, 1893, p. 109; Handlirsch, Foss. Insekt. 1908, p. 874.

Worker (Fig. 22a und b). Length between 4 and 5 mm.

Mandibles and clypeus longitudinally, antennal scrobes transversely, and head, antennal scapes, thorax, petiole and postpetiole very coarsely and reticulately rugose. The spaces between the rugæ are flat and apparently smooth. First gastric segment sharply longitudinally

striated above; its sides and the remaining segments smooth. Legs very coarsely punctate or reticulate-rugose.

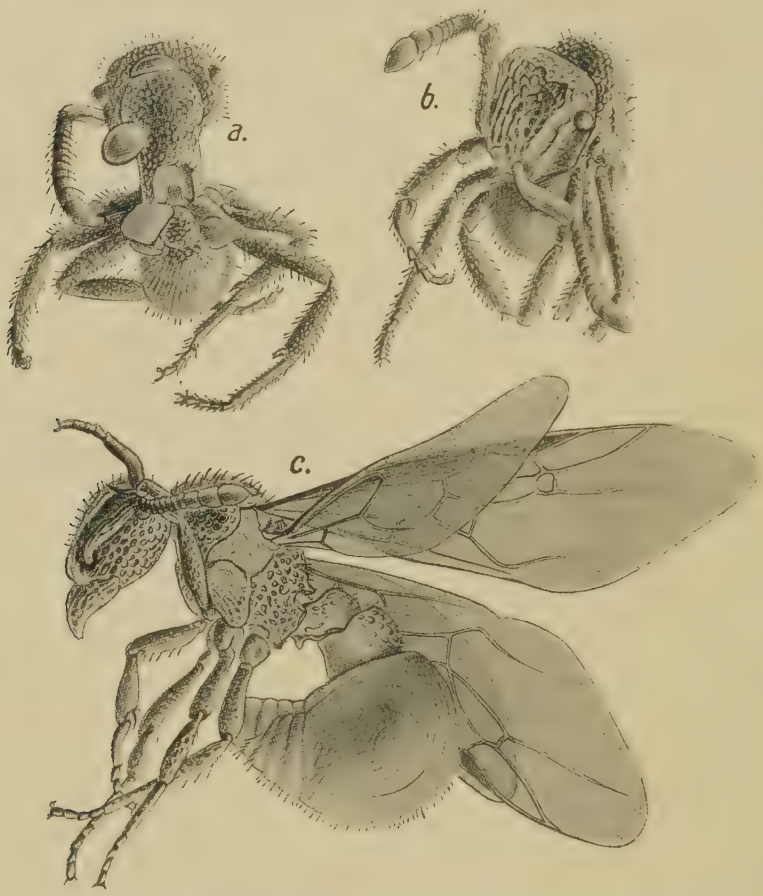

Fig. 22. *Agroecomyrmex duisburgi* MAYR. a) Worker, XXB 540, dorsal view; b) Worker, B 5164, ventral view; c) Female, lateral view.

Hairs rather short, stiff, erect; moderately abundant over the whole body and on the antennal scapes and legs. Pubescence on the antennal funiculi long and conspicuous.

Color black.

Female (Fig. 22c). Length about 5,5 mm.

Sculpture like that of the worker. The coarse, reticulate rugæ on the mesonotum and scutellum are somewhat longitudinal and the mesopleuræ and part of the mesocoxæ are more delicately longitudinally rugose. The striæ on the upper surface of the first gastric segment

are deepest in the middle of their course and fade out towards the base and posterior border of the segment.

Pilosity like that of the worker.

Color black; wings brownish, with darker brown veins and stigma.

Described from five specimens in the Geolog. Inst. Koenigsberg Coll.. four workers (No. 639/10246 — MAYR's type; 679/10331, XXB 540, B 5164) and a single female (B 260). All the workers have the body curled up so that the peculiar conical tip of the gaster can be seen in only one of them. The female, though it has a white film over much of the body, shows the structure of the gaster and pedicel and the sculpture of the different regions very clearly. The left fore wing has a small adventitions cell at the distal end of the second cubital cell.

MAYR saw only a single, poorly preserved specimen of this ant (No. 639) and was therefore quite unable to appreciate its remarkable characters. He overestimated the length of the worker, which he gave as about 6 mm, and his Figs. 87 and 88 are quite erroneous as may be seen by comparing them with my own. That the species cannot be assigned to the genus *Myrmica* is evident at a glance, and it is equally clear that none of the recent genera of Formicidæ can be made to receive it. In the structure of the head, thorax, petiole and postpetiole it closely resembles *Triglyphothrix* of the Old World tropics, but the pilosity, venation and especially the structure of the gaster remove it from this genus. In the character last mentioned, it is unique among the *Myrmicinæ* and recalls the gastric structure of the small group of *Ponerinæ* including the genera *Sysphincta*, *Proceratium*, *Discothyrea*, *Alfaria*, *Spaniopone* and *Bradoponera*.

Genus *Myrmica* LATREILLE.

Myrmica longispinosa MAYR.

Myrmica longispinosa MAYR, Beitr. Naturk. Preuss. I, 1868, p. 87, Taf. V, Fig. 86 ♀; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 112; HANDLIRSCH, Foss. Insekt. 1908, p. 874.

The only specimens of this species I have seen are MAYR's single type (No. 40/316) and an unnumbered specimen in the Geolog. Inst. Koenigsberg Coll. The former is rather poorly preserved, having the body curled up, and in great part enveloped in a white cloud, together with a small specimen of *Iridomyrmex gœpperti*. In MAYR's opinion the species is closely related to the recent *M. sulcinodis* NYL. of Europe. It shows distinctly the pectinated spurs on the middle and hind tibiæ.

Its long, pointed epinotal spines are subparallel and directed backward and but slightly upward. The second specimen shows the structure of the thorax, petiole, postpetiole and gaster clearly.

Genus *Nothomyrmica*, gen. nov.

I establish this genus to include MAYR's *Macromischa rudis* (which may be considered as the genotype), *M. rugosostriata*, and *petiolata* and a new species, since it is evident that these cannot be included in *Macromischa*. ROGER based this genus on a number of Cuban species. It has been recently redefined by EMERY to include also several other neotropical forms, which lack the spurs on the middle and hind tibiæ and have a distinctly pedunculate petiole, campanulate postpetiole and a short, convex thorax, usually without mesoëpinotal constriction. In the general structure of the body the species of *Nothomyrmica* resemble certain species of *Tetramorium* and *Xiphomyrmex*. the former with 11- the latter with 12-jointed antennæ, but in both of these genera the middle and hind tibiæ have spurs.

Nothomyrmica rudis (MAYR). (Fig. 23.)

Macromischa rudis MAYR, Beitr. Naturk. Preuss. I, 1868, p. 85, Taf. IV, Fig. 85, ☿; DALLA TORRE. Catalog. Hymen. VII, 1893, p. 120; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82: HANDLIRSCH, Foss. Insekt., 1908, p. 875.

Fig. 23. *Nothomyrmica rudis* MAYR. Worker, B 18981.

I have examined eight workers of this species from the Geolog. Inst. Koenigsberg Coll., namely No. 489/8739(MAYR'stype), B 19202, B 18852, XXB477, XIII 8784, B 236, B 18981 and one without a number; also one from the Brussels Museum (without a number and one (K 112) from the KLEBS Coll. The coarse, reticulate-rugose sculpture has been described by MAYR and is clearly shown in the accompanying figure. This species closely resembles *Myrmica longispinosa* MAYR

but the long epinotal spines are more erect and diverging, the metasternal angles are very prominent, acute and upturned, and there are no traces of spurs on the middle and hind tibiæ. The specimen marked B 18981 is in the same block of amber with a worker of *Iridomyrmex gœpperti,* which has died with its mandibles seizing the tip of the right antenna of the *Nothomyrmica.*

Nothomyrmica intermedia, sp. nov. (Fig. 24.)

Worker. Length 4,7 mm.

Closely resembling *N. rudis* and almost intermediate between this form and *Myrmica longispinosa* in many particulars. The eyes are smaller and much more convex, the epinotal spines somewhat more horizontal, though diverging, and more slender and sinuate, and the metasternal angles are smaller and more acute than in *rudis,* while the reticulate rugosity of the head and thorax is less coarse and more like that of *M. longispinosa.* There are no spurs on the middle and hind tibiæ. This is the only character that excludes the species from the genus *Myrmica.* The hairs covering the body are more delicate and less erect than in *N. rudis* and quite abundant on all parts of the body and on the appendages. The color is black.

Described from a single well-preserved specimen in the Geolog. Inst. Koenigsberg Coll.

Fig. 24.
Nothomyrmica intermedia, sp. nov. Worker.

Nothomyrmica rugososstriata (Mayr). (Fig. 25)

Macromischa rugososstriata Mayr, Beitr. Naturk. Preuss. I, 1868, p. 84, Taf. IV, Fig. 83, ♀; Dalla Torre, Catalog. Hymen. VII, 1893, p. 120; Handlirsch, Foss. Insekt. 1908, p. 876.

Mayr described this species from two specimens. It may be readily distinguished from *N. rudis* by its somewhat smaller size (about 4 mm), its shorter, blunter epinotal spines, which are directed backward and not upward, and its sculpture; the head, thorax, petiole and postpetiole being longitudinally and less coarsely rugose. The metasternal angles are blunt. The middle and hind tibiæ lack spurs.

I have seen ten workers from the Geolog. Inst. Koenigsberg Coll. namely No. 218/4297 (MAYR's type), B 19990, XXB 1476, XXB 9, XB 1539, B 19706, B 253 and three without numbers. In the same collection I find a single deälated female (B 18978) which evidently belongs to this species. It measures only about 4,5 mm and closely resembles the worker except for the usual modifications of the thorax and the presence of ocelli.

Fig. 25. *Nothomyrmica rugosostriata* MAYR. Worker, B 19706.

Nothomyrmica petiolata (MAYR).

Macromischa petiolata MAYR, Beitr. Naturk. Preuss. I, 1868, p. 85, Taf. IV, Fig. 83, 84, ♀; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 120; HANDLIRSCH, Foss. Insekt. 1908, p. 876.

Worker (Fig. 26). Length about 2,3—2,5 mm.

Head subrectangular, but little longer than broad, with rounded sides and straight posterior border. Eyes moderately large and convex, just in front of the middle of the head. Frontal carinæ prominent. Mandibles with several small, subequal denticles. Clypeus very convex in the middle, depressed on the sides, with rounded anterior border. Antennæ 12-jointed, slender, scapes not reaching to the posterior corners of the head, funiculus with a very distinct 3-jointed club, which is as long as the remaining joints taken together; first funicular joint as long as the three succeeding joints together; joints 2—7 narrow, subequal, about as long as broad; 8th joint somewhat longer than the preceding joints, as long as broad; terminal joint somewhat longer than the two basal joints of the club. Meso- and epinotum not separated by a suture, together forming a single rounded convexity in profile. Mesoëpinotal suture distinct. Epinotum depressed, armed with two sharp spines, which are as long as their distance apart at the base, directed backward, upward and outward and distinctly curved downward towards their tips, which are slender and acute. Petiole distinctly pedunculate in front, with a small, sharp tooth at its antero-ventral end; seen from above the segment is nearly twice as long as broad, broadest behind, with a pronounced, rounded node, somewhat compressed anteroposteriorly, so that its anterior declivity is deeply concave, its posterior surface steep and convex. Postpetiole about half again as broad as the petiole, nearly twice as broad as

long, transversely elliptical. Gaster distinctly larger than the head. Legs rather long, femora and tibiæ distinctly incrassated and clavate. the middle and hind tibiæ without spurs.

Mandibles and middle of clypeus apparently smooth; sides of clypeus indistinctly rugulose. Head longitudinally rugose, except in the occipital region where the rugæ are more reticulate. Pro- and mesonotum more coarsely reticulate-rugose. Epinotum and sides of petiole and postpetiole longitudinally and finely rugose; gaster, legs and summits of nodes smooth.

Hairs on the body coarse, erect, moderately abundant, most conspicuous on the gaster; very short and appressed on the legs and antennal scapes.

Color varying, according to the state of preservation, from golden brown to black.

Fig. 26.
Nothomyrmica petiolata Mayr.
Worker. B 1276.

Described from seven specimens in the Geolog. Inst. Koenigsberg Coll., namely: No. 237 7523 Mayr's type, 819 10925, B 242, B 255, XXB 5177, XXB 1276 and one without a number. Mayr saw only two specimens of this species, neither of which showed the sculpture of the head and thorax. At first sight the specimens seem to be referable to *Leptothorax* or *Pheidole*. The species is readily distinguishable from the other members of the genus *Nothomyrmica* by its small size, the curvature of the epinotal spines and the strongly pedunculate petiole, a character which Mayr has designated in the specific name.

Genus *Leptothorax* Mayr.

Leptothorax gracilis Mayr.

Leptothorax gracilis Mayr. Beitr. Naturk. Preuss. I. 1868. p. 89. Figs. 89—92, ♀ ♀; Dalla Torre. Catalog. Hymen. VII. 1893, p. 124; Handlirsch Foss. Insekt. 1908. p. 876.

The single worker, No. 7655 369, in the Geolog. Inst. Koenigsberg Coll., the ergatotype of this species, is badly decomposed and has apparently deteriorated since it was described by Mayr. As his description is rather indefinite I add a few remarks on structure and sculpture derived from the study of a large series of well-preserved specimens. The epinotal spines are shorter, stouter and less curved than Mayr supposed, although distinctly longer than broad at their bases and much further apart than long. They are directed backward.

The petiole is as long as high in profile; its node angular, with subequal anterior and posterior slopes, both slightly concave. Seen from above the postpetiole is broader than long and a little broader than the petiole. The mesoëpinotal constriction is fully as distinct as in the recent *L. acervorum*. The mandibles are very coarsely punctate, the cheeks longitudinally reticulate-rugose, the remainder of the head, the thorax, including the epinotal declivity, the petiole and postpetiole uniformly and densely punctate, and not rugulose-punctate as stated by MAYR. The type specimen is black, and this is also the color of a few other specimens I have seen, but most of them in a better state of preservation are red or ferruginous. The hairs on the body are blunt, those on the gaster being clavate as in most of the recent members of the genus.

I have examined the following specimens of this species: 24 workers in the Geolog. Inst. Koenigsberg Coll.: (7655/369 [MAYR's type], XXB 1229, 3784/132, XXB 6694, XXB 854, B 256, B 241, B 19462, XXB 587, XXB 1498 and 14 without numbers), three males from the same collection (10248/641 [MAYR's type], XXB 555 and B 19468) and five workers and a male in the KLEBS collection (K 2994, K 843, K 4479, K 5611, K 5805 and K 813).

Leptothorax glæsarius, sp. nov.

Worker. Length nearly 2 mm.

Closely resembling *L. gracilis*, but differing in its smaller size and in the following characters: The epinotum, instead of spines, bears two teeth which are not longer than broad at their bases. The petiole has on its anteroventral surface a large, pointed tooth, which is directed downward, and the node in profile is blunt and rounded above and behind, with only the anterior slope concave. The antennæ are 12-jointed as in *gracilis* and the thorax is impressed at the mesoëpinotal suture. The sculpture is also much as in this species, except that the humeri of the pronotum are coarsely reticulate-rugose. Erect hairs are visible on the body, but though blunt are slender and not clavate. The hairs on the scapes and legs are very short and appressed. The color is red beneath a golden air film which covers much of the body.

Described from a single worker (without a number) in the Geolog. Inst. Koenigsberg Coll.

Leptothorax longævus, sp. nov.

Worker. Length about 2,25 mm.

Head and eyes rather large. Antennæ 12-jointed; funicular joints 2—8 much broader than long. Thorax stout, not much narrower behind than in front, with a distinct constriction, both dorsally and laterally, at the mesoëpinotal suture. Epinotum with the base somewhat longer than the declivity, armed with two stout, blunt teeth, which are as broad at the base as long, compressed dorsoventrally and directed backward. Petiole short and stout, less than twice as long as broad, apparently unarmed below; node in profile rather acutely angular, with subequal, concave anterior and posterior slopes. Seen from above the border of the node is straight and transverse. Postpetiole small and rounded, not broader than the petiole. Gaster small, elliptical. Femora and tibiæ only slightly incrassated.

Mandibles and cheeks longitudinally rugose. Head delicately longitudinally rugulose and with large, scattered punctures. Thorax, petiole and postpetiole densely punctate, the meso- and metapleuræ more coarsely; pro-, meso- and epinotum above longitudinally rugulose. Gaster and legs smooth and shining, with much scattered, minute, piligerous punctures.

Erect hairs sparse, stout and clavate, short on the thorax, longer on the petiole, postpetiole and gaster; hairs on the scapes and legs very delicate and appressed.

Color blackish; surface covered with a silvery air film.

This species, which is very distinct in the shape of the thorax, epinotal teeth and in sculpture, is described from a single specimen, without a number, in the Geolog. Inst. Koenigsberg Coll.

Leptothorax hystriculus, sp. nov.

Worker. Length about 2,5 mm.

Body slender. Head distinctly longer than broad. Eyes moderately large. Mandibles 5-toothed. Clypeus convex in the middle, with broadly rounded, entire anterior border. Antennæ 12-jointed; joints 2—5 of the funiculus much broader than long. Thorax narrowed behind, with a very distinct constriction at the mesoëpinotal suture. Epinotum with two stout, rather blunt spines, which are fully as long as the base of the epinotum and longer than their distance apart at the base, directed backward and slightly upward and curved downward towards their tips. Petiole fully twice as long as broad, in profile with a rather low, rounded node, its ventral surface without a spine. Postpetiole

but little broader than the petiole and slightly broader than long. Gaster elliptical, its basal border not straight and transverse. Legs rather slender.

Head, thorax, petiole and postpetiole densely punctate, and the head and thorax also coarsely reticulate-rugose.

Erect hairs on body long, thick, blunt and clavate, much more conspicuous than in any of the other amber species of *Leptothorax*; hairs on the scapes and legs short, appressed and pointed.

Color red, surface more or less enveloped in a golden air film.

Described from a single specimen (X B 1270) in the Geolog. Inst. Koenigsberg Coll. This species is easily recognized by its peculiar sculpture, long, stout epinotal spines and coarse, clavate hairs.

Leptothorax placivus, sp. nov.

Worker. Length about 3,5 mm.

Head and eyes rather large. Antennæ 11-jointed; first funicular joint as long as the two succeeding joints together; joints 2—9 distinctly longer than broad; terminal joint of club as long as the two preceding joints together. Thorax rather robust, with very distinct mesoëpinotal constriction, on both the dorsal and pleural surfaces. Epinotum with two very blunt teeth or angles instead of spines, the base convex and a little longer than the concave, sloping declivity. Petiole about $1^1/_2$ times as long as broad, its node rather sharply angular in profile, with straight anterior and posterior slopes; its border straight and transverse. Postpetiole broader than long, broader than the petiole, very convex and rounded above. Gaster somewhat flattened above, convex below. Femora and tibiæ incrassated.

Mandibles striatopunctate; head finely reticulate and smooth, except the cheeks, which are coarsely longitudinally reticulate-rugose and the clypeus, which is finely and longitudinally rugulose. Thorax coarsely punctate, the pleuræ and epinotum also coarsely longitudinally rugose, the pronotum with feebler and more numerous rugæ. Petiole and postpetiole finely rugulose-punctate. Gaster and legs smooth and shining, with small, scattered, piligerous punctures.

Hairs very sparse, distinct only on the petiole, postpetiole and gaster, where they are moderately long and blunt, on the petiole and postpetiole also slightly clavate; on the scapes and legs the hairs are very fine and appressed.

Color blackish, legs and antennæ red in transmitted light.

Described from a single, beautifully preserved specimen (without a number) in the Geolog. Inst. Koenigsberg Coll. This species is easily

distinguished from all the preceding species by the 11-jointed antennæ. It does not closely resemble the recent *L. (Myrothorax) acervorum*, except in the number of antennal joints and the sculptural construction.

Genus *Stiphromyrmex*, gen. nov.

Worker. Head rather large, convex above, flattened below, with small eyes situated in front of the middle. Clypeus absent. Mandibles rather short, convex, 4-toothed. Maxillary palp 4-jointed, labial palp apparently 3-jointed. Ocelli inserted in the middle, short and depressed on the sides. Antennæ borne large, deep and distant, not covered by the frontal carinæ which seem to be very poorly developed. Antennæ 12-jointed, rather robust, with a 3-jointed club about as long as the remainder of the funicle. Thorax very short and longer and decidedly narrower than the head, slightly constricted on the sides in the mesopleural region but without pronotal and mesopleural sutures. Epinotum armed with a pair of long and powerful spines. Petiole and postpetiole narrow, the former with a short, subnodal peduncle, the latter constricted behind. Gaster subcylindrical, somewhat larger than the head, slightly narrower in front with a very large basal segment. Legs long and robust, the femora and tibiæ clavate, middle and hind tibiæ with simple spurs.
Genotype Stiphromyrmex robustus Mayr.

Stiphromyrmex robustus (Mayr).

Stigmomyrmex? robustus Mayr, Sitzb. Naturf. Freun. Berl. 1878, p. 87, Taf. V, Fig. 16f, ♀.

Stigmomyrmex robustus Emery, Ameis. Hymen. VII, 1891, p. 73; Handlirsch, Foss. Insekt, 1906, p. 873.

Worker (Fig. 27). Length about 3,5 mm.

Head nearly as broad as long, with convex, rounded sides and rather deeply excised posterior border. Mandibles short and convex, with two blunt subapical apical and two smaller basal teeth. Antennal scapes curved at the base and reaching about half the distance from their insertions to the posterior corners of the head; first funicular as long as the three succeeding joints together; joints 2—7 much broader than long, joint 8 nearly as long as broad, terminal as long as the two preceding subapical joints. Thorax rounded and convex in front, narrower anteriorly, with subparallel sides behind, the latter region embracing the epinotum, the former the combined pro- and mesonotum. In profile the dorsal outline of the whole thorax to the base of the

epinotal spines is feebly and evenly rounded. Epinotal spines very large, stout and laterally compressed at their bases and rather rapidly tapering to their acute tips; they are slightly longer than their distance apart at the base, directed obliquely backward, outward and upward and curved downward towards their tips. Base and declivity of epinotum short and subequal, the former concave. Metasternal angles blunt. Petiole from above about $1^1/_2$ times as long as broad, broader behind than in front, without a ventral tooth and with a low node, which in profile has a long, straight anterior, and a feebly convex, much shorter, posterior declivity. Postpetiole short, about $^1/_2$ again as broad as the petiole and nearly twice as broad as long, transversely elliptical.

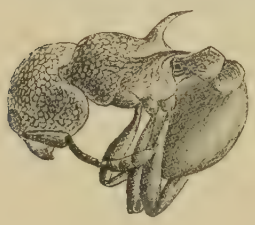

Fig. 27.
Stiphromyrmex robustus MAYR. Worker B 18605.

Mandibles coarsely striato-punctate, cheeks and middle of clypeus very coarsely reticulate-rugose, remainder of head and thorax covered uniformly and closely with large circular foveolæ like the impressions on a thimble; the petiole and postpetiole with similar but more elongate impressions, so that these segments seem to be grossly reticulate-rugose. Epinotal spines, gaster, legs and antennal scapes smooth.

Hairs moderately long, erect and sparse on the body; shorter, more reclinate and more abundant on the legs, scapes and funiculi.

Color black.

Described from two specimens, B 18605 and one without a number, in the Geolog. Inst. Koenigsberg Coll. Both have the body much curled and the unnumbered specimen is rather poorly preserved, though it shows the pilosity and the sculpture of the mandibles better than B 18605. The latter is in an excellent position for the study of most of the characters, and is in clear amber. I have redescribed the species because MAYR saw only a single specimen which had lost both antennal funiculi. He therefore expressed some doubts concerning its generic position. As *Stigmomyrmex* has 10-jointed antennæ and a very different habitus, I have not hesitated to establish a new genus for the reception of *S. robustus*.

The genus *Stiphromyrmex* seems to be rather closely related to the paleotropical *Pristomyrmex*, but the workers of this latter genus have 11-jointed antennæ, the middle and hind femora lack the spurs, the mandibles are of a very different shape and the frontal carinæ are prolonged backward as ridges bordering scrobe-like depressions for the antennæ.

Tribe Tetramoriini Emery.

Parameranoplus, gen. nov.

Worker. Resembling *Meranoplus* but more primitive in structure. Head large, subrectangular, somewhat flattened above, convex below, with broadly and deeply excised posterior border and large frontal carinæ which are continued back above the eyes as prominent ridges forming the mesial borders of a pair of antennal scrobes which seem to be much shallower than in *Meranoplus*. Eyes small, near the middle of the sides of the head. Ocelli absent. Frontal area rather large, deeply impressed. Clypeus not visible in the specimen. Mandibles large, apparently bluntly dentate. Antennæ 11-jointed, scape curved at the base, funiculus terminating in a 3-jointed club, which is about as long as the remainder of the funiculus. Thorax with pointed humerial angles and flattened upper surface. Promesonotal and mesoëpinotal sutures distinct. Epinotum armed with two spines. Petiole and postpetiole small, the former distinctly pedunculate, the latter constricted behind. Gaster as large as the head, flattened dorso-ventrally, apparently with very large basal segment. Legs with clavate femora; middle and hind tibiæ furnished with simple spurs.

Parameranoplus primævus sp. nov.

Worker (Fig. 28). Length about 4 mm.

Antennal scapes reaching to about 2/3 the distance from their bases to the posterior corners of the head; first funicular joint somewhat longer than broad, shorter than the two succeeding joints together; joints 2—7 a little broader than long, joints 8 and 9 as broad as long and together somewhat shorter than the terminal joint. Pronotum marginate in front and apparently with a raised and flattened circular disc on its upper surface, mesonotum semicircular, its anterior border straight, joining the posterior edge of the pronotal disc at the promesonotal suture. Base of epinotum short and flat, extending on each side behind into the spines which are flat, pointed, directed backward and curved inward so that they seem to form a crescentic plate. Epinotal declivity abrupt and apparently concave. Petiole about $1^1/_2$ times as long as broad, gradu-

Fig. 28. *Parameranoplus primaevus* sp. nov. Worker, α 74.

ally widening posteriorly, where it projects above in the form of a prominent node distinct from the peduncle. Postpetiole somewhat broader than the petiole and slightly broader than long, with rounded sides and dorsal surface.

Head between the carinæ regularly and coarsely longitudinally rugose, the occipital region coarsely and indistinctly reticulate-rugose. The sculpture of the thorax and pedicel cannot be determined. The disk of the pronotum and the sides of the petiole and postpetiole seem to be longitudinally rugose. The gaster and legs are smooth.

Hairs long and slender, sparse on the head and thorax, more abundant on the gaster, shorter on the femora and tibiæ.

Black, much of the gaster yellowish and decomposed.

Described from a single specimen (α 74) in the KLEBS Coll. The amber is cloudy and full of small cracks and the clypeus, mouth parts and tip of the gaster are enveloped in a dense white substance so that the details of their structure cannot be clearly seen. The paleotropical genera *Meranoplus* and *Triglyphothrix* seem to comprise the nearest living allies of this insect, but more and better material will be required to establish its true position.

Genus ***Stigmomyrmex*** MAYR.

Stigmomyrmex venustus MAYR (Fig. 29).

Stigmomyrmex venustus MAYR, Beitr. Naturk. Preuss. I, 1868, p. 97, Taf. V, Figs. 99, 100, ☿; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 78; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 873.

I have seen four worker specimens of this species in the Geolog. Inst. Koenigsberg Coll., namely, No. 5/20 (MAYR's type), XX B 1294,

Fig. 29. *Stigmomyrmex venustus* MAYR. Worker, B 1407.

B 18921 and XX B 1407. Of these the last is in a fine state of preservation in a very clear block of amber. This specimen I have

figured to show the peculiar, umbilicate punctures covering the head and thorax. These punctures, however, are somewhat too large in the figure. MAYR's description is, on the whole, very accurate and enables one to recognize the species easily. The antennæ are 10-jointed, the eyes a little in front of the middle of the head, the petiole is not pedunculate in front and the femora and tibiæ are distinctly incrassated, the middle and hind pairs of the latter being without spurs. The hairs are absent on the legs, but long, suberect and moderately abundant on the head, thorax, pedicel, gaster and anterior surfaces of the antennal scapes. The funiculi are pubescent. The gaster is apparently opaque and shagreened or finely punctate, with larger, more scattered, piligerous punctures. All the specimens are reddish brown. Length about 2,6 mm.

Genus *Enneamerus* MAYR.

Enneamerus reticulatus MAYR (Fig. 30).

Enneamerus reticulatus MAYR, Beitr. Naturk. Preuss. I, 1868, p. 100, Taf. V, Figs. 102, 103, ♀; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 78; HANDLIRSCH, Tert. Insekt. 1908, p. 873.

I have seen ten specimens of this peculiar little ant with 9-jointed antennæ, five in the KLEBS collection (K 4248, with two specimens in the same block of amber, K 1698, K 1682, and K 820) and five in the Geolog. Inst. Koenigsberg Coll. (B 18306, B 18227, B 18179, 1003/14362 and one without a number). It resembles the members of the paleotropical genera *Myrmicaria* and *Pristomyrmex* in form and sculpture, but the worker of *Myrmicaria* has only seven and *Pristomyrmex* has eleven antennal joints. The resemblance to *Myrmicaria* was noted by MAYR, who has described the species sufficiently.

Fig. 30.
Enneamerus reticulatus MAYR. Worker, K 820.

Subfamily Dolichoderinæ.

Tribe Aneuretini EMERY.

Protaneuretus gen. nov.

Worker. Allied to *Aneuretus* EMERY. Head somewhat longer than broad, somewhat narrower in front than behind, with rather convex sides. Eyes moderately large and convex, near the middle of the sides of the head. Ocelli absent. Mandibles triangular, well-developed,

with broad, minutely denticulate apical borders. Clypeus large. Frontal carinæ subparallel, rather long, slightly curved, most prominent in front. Antennæ rather stout, 12-jointed, the funiculi enlarged towards the tip, consisting of joints of subequal length, without a differentiated club. Thorax narrower than the head, but little narrower behind than in front, with sharply defined promesonotal and mesoëpinotal sutures, moderately constricted at the latter. Metathoracic spiracles large, projecting, approximated dorsally in the mesoëpinotal constriction. Epinotum nearly as large as the remainder of the thorax, bidentate. Petiole much longer than broad, slender and pedunculate anteriorly, surmounted behind the middle by a rather high, rounded node, behind which it is abruptly constricted. Gaster large, oval, not over-hanging the petiole anteriorly. Sting very long and well-developed. Legs rather slender, all the tibiæ with feebly but distinctly pectinated spurs. Claws simple.

Female (deälated). Scarcely larger than the worker and much like it except in the more robust thorax, larger eyes and the presence of ocelli.

This genus is very close to the genus *Aneuretus* represented by a single species, *A. simoni* EMERY, living in Ceylon and known only from the worker phase, but the head is less cordate, the eyes are much larger, the frontal carinæ are longer and much more elevated and the antennæ, legs and peduncle of the petiole are much less slender.

Protaneuretus succineus sp. nov.

Worker (Fig. 31a—c). Length 5,5—7 mm.

Clypeus and mandibles feebly convex, the former apparently with broadly rounded, entire anterior border. Antennal scapes reaching a little more than halfway between the posterior orbits and the posterior corners of the head; joints 1—5 of the funiculi a little longer than broad; joints 6—10 as broad as long, terminal joint as long as the two preceding together. Pronotum about as long as broad; mesonotum small, elliptical, a little longer than broad. Epinotum with subequal base and declivity, the former convex and rounded, the latter flat and sloping. Teeth of the epinotum directed upward, not longer than broad at their bases, much further apart than long. Node of petiole rising rather abruptly from the peduncle, with flattened anterior surface, rounded superior and convex posterior surfaces; seen from above it is transverse and slightly compressed anteroposteriorly.

Surface of body shining, smooth and sparsely punctate; mesoëpinotal constriction, meso- and metapleuræ longitudinally, basal surface of epinotum transversely rugose.

Hairs moderately abundant, long, pointed, covering not only the body but also the scapes, funiculi and legs.

Color black.

Female (Fig. 31d). Length about 7 mm.

Fig. 31. *Protaneuretus succineus* sp. nov. a) Worker α 139, from above; b) thorax and petiole of same; c) Worker XXB 910 in profile; d) Female in profile.

Differing from the worker in having the mesonotum and scutellum coarsely, the pleuræ finely and densely punctate.

Described from a single worker (α 139) in the KLEBS Coll., two workers (XXB 910 and one without a number) and a female (without a number) in the Geolog. Inst. Koenigsberg Coll., and a worker (2172) in the collection of Mr. WM. HAREN. No. XXB 910 is in the same block with two workers of *Iridomyrmex gœpperti* MAYR.

Paraneuretus gen. nov.

Worker. Body and appendages long and slender. Head, excluding the mandibles, $1^1/_2$ times as long as broad, narrower in front

than behind, where it is evenly rounded, and without posterior angles. Eyes large and convex, at the middle of the sides of the head. Ocelli lacking. Mandibles long, narrow, triangular, bent downwards at their tips, with straight external and finely denticulate apical borders. Maxillary palpi long, 6-jointed, labial palpi 4-jointed. Clypeus short and broad; clypeal apparently confluent with the antennal fovea. Frontal area distinct, frontal groove obsolete Frontal carinæ straight, subparallel, rather short. Antennæ long and slender; funiculi not enlarged towards their tips, all the joints much longer than broad. Thorax very long and narrow; seen from above somewhat dumb-bell-shaped, with a long, deep mesoëpinotal constriction. Both the meso- and metathoracic spiracles very prominent, the latter approximated in the dorsal concavity of the mesoëpinotal constriction. Pro- and mesonotum feebly convex, the former with a long neck, epinotum inflated, egg-shaped when seen from above, in profile very convex and rounded, without differentiated base and declivity. Petiole shaped somewhat like that of *Protaneuretus*, but the peduncle very short and the anterior slope of the node rising gradually, the posterior slope much more abrupt. Gaster large, oval, its base not overhanging the petiole. Sting long and well-developed. Legs long and slender; all the tibiæ with distinctly pectinated spurs; claws long and simple.

Male. As large as the worker. Body long and slender. Head, excluding the mandibles about as long as broad, with large, prominent eyes and ocelli and short cheeks. Clypeus small, with feebly sinuate anterior border. Mandibles similar to those of the worker, with well-developed, triangular blades and long, denticulate, apical margin. Palpi long, maxillary pair 6-jointed, labial pair 4-jointed. Antennæ long, filiform, 13-jointed, scapes somewhat thickened, cylindrical and about as long as joints 2—12 of the funiculus, which are subequal; first funicular joint only a little longer than broad. Thorax rather slender, mesonotum with pronounced Mayrian furrows; epinotum sloping, rounded, without differentiated base and declivity. Petiole shaped much as in the worker. Gaster apparently variable in shape, in the type species long and narrow, longer than the thorax; external genitalia small, retacted. Cerci not visible. Legs long. Wings rather short, with a discal, two complete cubital cells and a closed marginal cell, the venation closely resembling that of *Iridomyrmex*. Type: *Paraneuretus tornquisti* sp. nov.

This genus is evidently related to *Aneuretus* and *Protaneuretus* but differs from these greatly in the more slender form of the body and especially in the shape of the head and thorax of the worker.

Paraneuretus tornquisti sp. nov.

Worker. (Fig. 32.) Length 8—10 mm.

Clypeus convex in the middle, depressed on the sides, its anterior border sinuately excised in the middle. Antennal scapes reaching about $^1/_3$ their length beyond the posterior border of the head; none of the funicular joints less than twice as long as broad, the terminal joint shorter than the two preceding together. Pronotum longer than broad, as is also the mesonotum, which is small and elliptical; epinotum as broad as the pronotum, the long, constricted mesoëpinotal region only about $^2/_3$ as broad as the pronotum. Petiole

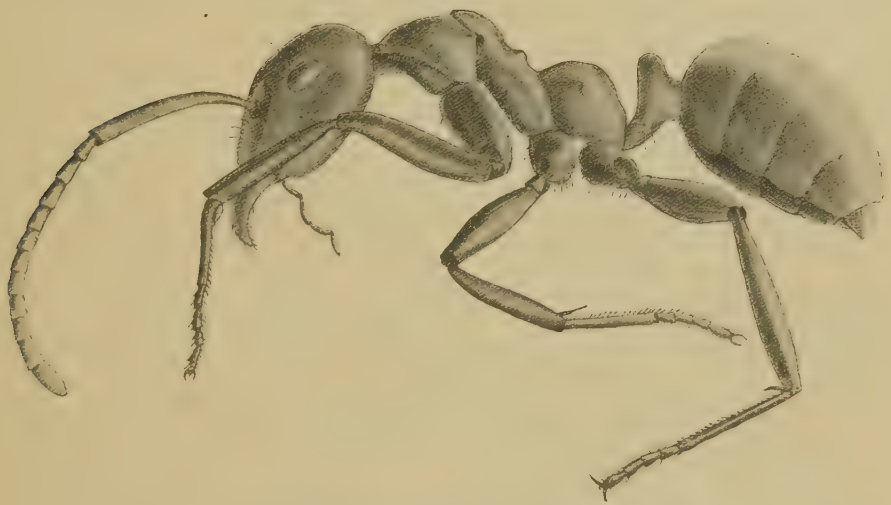

Fig. 32. *Paraneuretus tornquisti* sp. nov. Worker, K 4170.

about twice as long as broad, with parallel sides; in profile as long as its height through the node, which is inclined slightly backward and has a long concave anterior, abruptly perpendicular posterior surface and bluntly rounded summit, which, seen from behind, is transverse and feebly impressed in the middle.

Body shining, very finely and densely punctate, except the antennal foveæ, which are quite glabrous and the mandibles, which are coarsely punctate.

Hairs sparse, erect, apparent only on the gaster, mandibles, clypeus and palpi.

Color black or reddish.

Male. Length about 10 mm.

Head evenly rounded posteriorly, semi-circular behind the eyes. Antennae extending back only to the base of the second gastric segment. Thorax through the mesonotum scarcely broader than the head through the eyes. Petiole longer than broad and longer than high through the node, which is at the posterior end of the segment, rounded above, with long, slightly concave anterior slope and short, straight, vertical posterior declivity. Gaster longer than the thorax, narrow, with parallel sides, slightly broader at the tip than at the base. Stipites of genitalia small, narrow and pointed: volsellæ short, robust and blunt at their tips. Hypopygium with the posterior border pointed in the middle, feebly and sinuately excised on each side.

Sculpture, pilosity and color as in the worker. Wings hyaline with pale veins and stigma.

Described from 24 specimens: 17 in the Geolog. Inst. Koenigsberg Coll. (B 18827, B 18551, B 5266, XXB 1434, B 19845, B 5177, B 5400, XXB 1475, B 797 and 8 without numbers), 4 in the KLEBS Coll. (K 4036, K 4170, α 132, K 6415, two in the collection of Mr. WM. HAREN (1349 and 2435) and one (274) in the Berlin Museum.

This ant is readily distinguished in the worker phase from all the other amber species by its singular, constricted thorax and inflated, egg-shaped epinotum. Its slender habitus recalls somewhat that of the Australian *Leptomyrmex,* but it has no close affinity with this strange genus.

Of the two male specimens which I refer to *P. tornquisti,* one the androtype (B 797) is very clear, the other (without a number) is opaque, with a white coating, and the wings seem to be of a darker color, but I am unable to detect any other differences of importance. I believe that I am not mistaken in referring these males to *P. tornquisti.* They closely resemble the males of the Ponerinæ, but this would be expected from the affinities of the worker. There is, however, no trace of a constriction between the first and second gastric segments, nor of the cerci as in most Ponerine males, and the mandibles are well developed, whereas these appendages are imperfectly developed and the cerci are well-developed in the Ponerinæ of the section Euponerinæ that lack the gastric constriction.

The occurrence of the two genera *Protaneuretus* and *Paraneuretus* in the Baltic amber is of considerable interest on account of their close relationship to the recent genus *Aneuretus,* which is regarded as a kind of connecting link between the subfamilies *Ponerinæ* and *Dolichoderinæ.* The amber species are in certain respects even more primitive and generalized and are of larger size than the single

known species of *Aneuretus*. They show that the tribe Aneuretini was long ago represented by several distinct and peculiar genera, of which only one has survived the Tertiary.

Paraneuretus longicornis sp. nov.

Male. Length nearly 7 mm.

Differing from the male of the preceding species in the following characters: Body smaller, eyes larger, more convex and more nearly circular, palpi longer, antennæ much longer, being as long as the body (7 mm). (Those of *P. tornquisti* are about 7 mm with a body length of about 10 mm.) The petiolar node of *P. longicornis* is proportionally longer through its base and the gaster is much shorter and elliptical, and the genitalia are much more retracted so that their form cannot be determined. The wings have the same venation as in *P. tornquisti*, but their membranes are uniformly brown, with somewhat darker veins and stigma.

Surface of body shining, finely shagreened.

Erect hairs absent, except on the clypeus and mandibles, where they are short; antennæ and legs clothed with short, appressed pubescence.

Color dark brown.

Described from a single, very clear specimen (K 7500) in the Klebs Coll. Notwithstanding the different shape of the gaster, I believe that this specimen belongs to the genus *Paraneuretus*.

Tribe Dolichoderini Emery.

Genus ***Dolichoderus*** Lund.

Subgenus ***Hypoclinea*** Mayr.

Dolichoderus (Hypoclinea) cornutus (Mayr).

Hypoclinea cornuta Mayr, Beitr. Naturk. Preuss. I, 1868, p. 61, Taf. III, Fig. 52. ♀ – *Dolichoderus cornutus* Forel, Bull. Soc. Vaud. Sc. Nat. (2) XV P. 80, 1878, p. 386; Dalla Torre, Catalog. Hymen. VII, 1893, p. 158; Ern. André, Bull. Soc. Zool. France, XX, 1895, p. 82; Handlirsch, Foss. Insekt. 1908, p. 869.

This species, which is known only from the worker phase, and is very easily recognized by its huge divergent epinotal spines, has been adequately described and figured by Mayr. At first sight it looks like a *Polyrhachis*, as Mayr remarks, but the structure of the head at once shows it to be a true *Dolichoderus*, allied to some of the recent Australian forms, notably to *D. doriæ* Emery, *scabridus*

ROGER and *ypsilon* FOREL, though the sculpture of all of these is very different.

I have seen 16 workers of *D. cornutus*, 8 in the KLEBS Coll. (K 1026, K 804, K 855, K 802, K 5792, K 1048, K 831, and α 146) and 8 in the Geolog. Inst. Koenigsberg. Coll. (8743/493, MAYR's type; XXB 28, B 18291, B 18255, B 18214, B 18815, B 18655 and one without a number). The head is lacking in MAYR's type.

Dolichoderus (Hypoclinea) balticus (MAYR) (Fig. 33).

Hypoclinea baltica MAYR, Beitr. Naturk. Preuss. I, 1868, p. 64. Taf. IV, Fig. 61 bis 64, ☿♀♂.

Dolichoderus balticus FOREL, Bull. Soc. Vaud, Sc. Nat. (2) XV, P. 80, 1878, p. 386; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 157; ERN. ANDRÉ, Bull. Soc. Zool. France XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 869.

MAYR based this species on six workers, a single deälated female and a single male specimen. I have examined two of the worker types in the Geolog. Inst. Koenigsberg Coll., namely 3740/88 and 7636/350 and find the former to be a specimen of *D. tertiarius* MAYR.

Fig. 33. *Dolichoderus (Hypoclinea) balticus* MAYR. Worker.

The latter agrees with MAYR's description and figure. Two deälated females in the same collection (B 19736 and B 19729) also agree closely with the description. There is a male (10835/775) marked „*Hypoclinea baltica*" in this collection and another in the KLEBS Coll., which agree with MAYR's description, but I doubt whether either really belongs to this species. This doubt extends to all the male *Dolichoderi* described by MAYR from the amber. Even the males of the recent species of the genus are so imperfectly known that EMERY could not draw up a satisfactory generic diagnosis of the sex in his recent revision of the *Dolichoderinæ* in the Genera Insectorum. Although there are in the Geolog. Inst. Koenigsberg. Coll. several other males which seem to belong to the genus *Dolichoderus*, I have not attempted

to correlate them with the workers, because much more material than I have seen will be needed for this task, and because it can be undertaken only after the males of the recent species have been more carefully studied.

To MAYR's description of the worker *D. balticus* the following remarks may be added: The head is large, broader behind than in front, with distinct posterior corners and concave posterior border. The eyes are large, but only moderately convex. The antennal scapes do not surpass the posterior border of the head, as MAYR states and, in fact, do not reach it; the funicular joints are all less than twice as long as broad, except the last one. The thorax is stout, the humeri of the pronotum distinctly, though bluntly, angular, the pronotum nearly twice as broad as long, the mesonotum elliptical, only a little longer than broad, the base of the epinotum about $^1/_4$ longer than broad and its straight posterior about $^1/_3$ longer than its anterior margin; its sides are straight. The whole body is shining and finely shagreened, the head also covered with coarse but shallow punctures, the neck and declivity of the epinotum are transversely rugose. The hairs on the body are erect and sparse and most abundant on the gaster; on the legs and scapes they are very short and appressed.

I have seen 18 workers two males and two females of this species, in addition to the two dubious males mentioned above. These specimens are distributed as follows: one worker (without a number) in the Brussells Museum, five workers and a male in the KLEBS Coll. (K 766, K 5080, K 1054, K 1752, α 30, K 5109); one male, 11 workers and two females in the Geolog. Inst. Koenigsberg Coll. (7636/350, MAYR's type; 10836/775, B 5236, B 19736, B 19729, B 18553, B 18957, B 18732, B 18603, and 6 without numbers).

Dolichoderus (Hypoclinea) passalomma sp nov.

Worker (Fig. 34). Length about 7 mm.

Head, excluding the mandibles, somewhat longer than broad, elliptical, but little narrower in front than behind, without distinct posterior corners, with nearly straight posterior and convex lateral borders. Eyes a little behind the middle of the sides of the head, small, very convex and somewhat conical, as high as broad, consisting of very small ommatidia. Anterior border of clypeus rather deeply excised in the middle. Antennæ slender, scapes reaching a little beyond the posterior border of the head; joints 1—3 of the funiculus more than twice as long as broad, remaining joints nearly twice as long as broad. Thorax rather short and stout. Pronotum fully twice as

broad as long, with rounded humeri. Mesonotum broadly elliptical; mesoëpinotal constriction short and deep. Epinotum with short and very convex base, which is not longer than broad and passes into the longer, slightly concave, sloping declivity without a distinct ridge or angle. Petiole short and rather narrow, its node inclined forward, transverse and anteroposteriorly compressed, its border seen from behind rounded, in profile the anterior surface is feebly convex, the posterior slightly concave, the border rather acute. Gaster large, elliptical. Legs long and rather slender.

Fig. 34.
Dolichoderus (Hypoclinea) passalomma sp. nov. Worker.

Surface of body shining, densely shagreened; mandibles punctate; clypeus longitudinally rugose, finely in the middle, more coarsely on the sides; head coarsely, body more sparsely and finely punctate.

Hairs erect, moderately long and sparse, distinct on the head and thorax, most abundant on the gaster, rather long and appressed on the legs, apparently absent on the scapes except at their tips.

Color black.

Described from 10 specimens in the Geolog. Inst. Koenigsberg Coll. (B 18820, B 5446, B 5415, B 5440, B 5106, XXB 7180 and four without numbers).

At first sight this species resembles *D. balticus*, but it may be readily distinguished by the narrower, more elliptical head, the longer antennæ, more rounded humeri, the shape of the epinotum and especially by the smaller and peculiarly protruding, subconical eyes.

Dolichoderus (Hypoclinea) elegans sp. nov.

Worker. (Fig. 35.) Length about 7,5 mm.

Head elliptical, longer than broad, not broader behind than in front, without posterior corners, but with short, excised posterior border. Eyes moderately large, very convex, hemispherical, but not subconical. Mandibles rather short. Clypeus evenly convex, with entire, broadly rounded anterior border. Antennæ long and slender, the scapes reaching about $^1/_3$ their length beyond the posterior border

of the head; the three basal funicular joints each about 3 times as long as broad, remaining joints somewhat shorter. Thorax long and narrow, pro- and mesonotum in profile very feebly convex above, the humeri rounded and sloping, mesoëpinotal constriction long and moderately deep, bearing the prominent, approximated metathoracic spiracles at the middle of its dorsal concavity. Epinotum about half as long as the combined pro- and mesothorax, with subequal base and declivity, the former in profile rising rather suddenly and at first convexly and then with a flat surface to a transverse ridge which separates it from the declivity. The latter slopes back obliquely and is only slightly concave. Petiolar node anteroposteriorly compressed, inclined forward, with rather a sharp, pointed border, convex anterior and concave posterior surface; posterior constricted portion of the petiole nearly as long as the node is high. Gaster large. Legs long and slender.

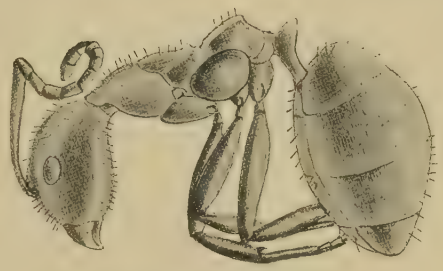

Fig. 35. *Dolichoderus (Hypoclinea) elegans* sp. nov. Worker, B 14126.

Surface shining; mandible and clypeus very finely longitudinally rugulose; head densely punctate and on the front, vertex and behind the eyes with a number of shallow foveolæ. Thorax, petiole and gaster finely shagreened and sparsely punctate, the surface of the meso- and epinotum uneven.

Hairs erect, moderately long and abundant on the head, thorax and gaster; scapes and legs invested with fine, appressed pubescence.

Color black; mandibles red; whole body covered with a silvery air film.

Described from a single beautifully preserved specimen (B 14126) in the Geolog. Inst. Koenigsberg Coll.

This species is much more slender than *D. balticus* and *passalomma* and the head and thorax are of a very different shape. The eyes are much more convex than in *balticus* but much larger and less protruding than in *passalomma.*

Dolichoderus (Hypoclinea) mesosternalis sp. nov.

Worker (Fig. 36.) Length 5,5—7 mm.

Head elliptical, excluding the mandibles fully $1^1/_3$ times as long as broad, with evenly convex sides and nearly straight posterior

border, and without posterior angles. Eyes a little in front of the middle of the sides of the head, rather large, very convex, hemispherical. Clypeus convex, its anterior border feebly and sinuately excised in the middle. Antennæ rather stout, scapes reaching a little beyond the posterior border of the head, funicular joints 1—5 at least twice as long as broad, remaining joints, except the last, less than twice as long as broad. Thorax long, deeply constricted in the mesoëpinotal region. Pronotum flattened above and on the sides, at least twice as long as broad, its raised anterior border high and

Fig. 36. *Dolichoderus (Hypoclinea) mesosternalis* sp. nov. Worker B 18806.

broadly rounded, its humeri scarcely angular. Mesosternum armed at its base on the anterior border with a blunt tooth, which is directed downward and forward. Mesonotum fully twice as long as broad and nearly twice as broad in front as behind. Base of epinotum rising abruptly in profile in a convex curve, terminating behind in a sharp border, whence the longer declivity slopes downward and backward. Seen from above the base of the epinotum is slightly longer than broad, very narrow in front and rapidly broadening behind, with convex lateral and posterior borders. Petiole rather high, its node placed anteriorly and inclined forward; in profile it is cuneate, with feebly convex anterior and posterior surfaces and rather blunt upper border. Seen from above the petiole is about $^2/_3$ as broad as the base of the epinotum. Gaster large, with a slight constriction between the first and second segments. Legs long and slender.

Surface shining; mandibles coarsely punctate and finely striate, at least at the base. Clypeus sharply, longitudinally rugose. Head, pro- and mesonotum and base of epinotum covered with large, deep, circular or slightly elliptical foveolæ. These are somewhat shallower on the mesonotum. Neck transversely rugose. Petiole and declivity

of epinotum coarsely shagreened; gaster and legs finely shagreened, with scattered, piligerous punctures.

Hairs on the head, thorax and gaster moderately long, erect and uniformly distributed. Lower surfaces of fore femora also with a few erect hairs, otherwise the legs and scapes bear only fine, appressed hairs or pubescence.

Color black.

Described from four specimens in the Geolog. Inst. Koenigsberg Coll. (B 18806, type, B 18745, B 18576 and one without a number) and one in the Klebs Coll. (K 5625). All of these specimens are more or less enveloped in silvery air films and all show most of the described peculiarities very distinctly. This species is distinguished from all the other described amber *Dolichoderi* by the tooth on the mesosternum, from *D. elegans* by the remarkable sculpture and the shape of the epinotum, and by the latter character from any of the following species of the genus.

Dolichoderus (Hypoclinea) vexillarius sp. nov.

Worker (Fig. 37.) Length 5,5—6 mm.

Closely related to *D. mesosternalis*, but differing in the following characters: The posterior border of the head is more concave, the anterior raised border of the pronotum is straight and transverse, terminating in the humeri, which are distinctly, though rather bluntly angular. The whole pronotum, including the neck, is about as long as broad. The base of the epinotum rises perpendicularly and convexly from the meso-ëpinotal constriction, forming almost a right angle with the latter, so that it appears much shorter when seen from above and the concave declivity is more perpendicular. The mesosternum bears no tooth. The sculpture is like that of *mesosternalis*, but the foveolæ on the mesonotum are quite as distinct as on the pronotum, though they are feebler on the meso- and metapleuræ. The pilosity and color are very similar to those of *mesosternalis*.

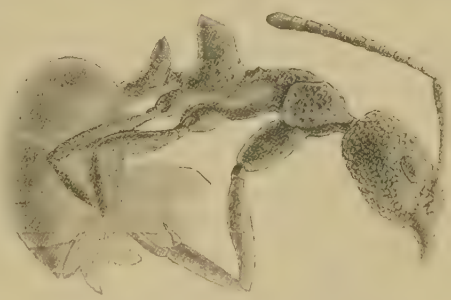

Fig. 37. *Dolichoderus (Hypoclinea) vexillarius* sp. nov. Worker, B 1689.

Described from six workers in the Geolog. Inst. Koenigsberg Coll. (B 1689 type, B 18756, XXB 2137, XXB 203, XXB 222 and

7660/374). The last number is the first of two specimens mentioned by MAYR as the ones on which he based his *D. sculpturatus*, but his figure and description are not drawn from this specimen. It is rather badly decomposed and though it is in clear amber and in a favorable position to show the general form of the body, the sculpture is very indistinct.

D. vexillarius seems to be most closely related to the recent *D. monoceros* described by EMERY from New Guinea. This form, however, is not strongly sculptured and the erect epinotum is prolonged in to a sinuous, horn-like projection above.

Dolichoderus (Hypoclinea) sculpturatus (MAYR) (Fig. 38).

Hypoclinea sculpturata MAYR, Beitr. Naturk. Preuß. I, 1868, p. 63 Taf. IV figs. 53—55. ♀.

Dolichoderus sculpturatus FOREL, Bull. Soc. Vaud. Sc. Nat. (2) XV. P. 80, 1878 p. 386; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 161; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 869.

As stated in connection with the preceding species, MAYR based his *Hypoclinea sculpturata* on two specimens, No. 374 in the Geolog. Inst. Koenigsberg. Coll. and a specimen in the MENGE Coll. His description and figures are drawn from the latter alone, which is to be regarded as the type, whereas the former is a very different species, which has been described above as *D. vexillarius*.

The worker of *D. sculpturatus* measures only 4 mm in length and is, therefore, decidedly smaller than the workers of the two preceding species. The head is proportionally shorter and broader and less narrowed behind, the eyes are large but less convex, the thorax is shorter and the base of the epinotum less elevated and when seen from above much less narrowed anteriorly, with straighter sides and posterior border and the declivity is more concave and perpendicular, lying completely under the base. There is no mesosternal tooth. The petiole has a lower node, which is much less compressed anteroposteriorly and with a blunter border. There is a slight constriction between the first and second gastric segments. The

Fig. 38. *Dolichoderus (Hypoclinea) sculpturatus* MAYR. Worker.

legs and antennæ are much stouter and shorter, the scapes do not reach beyond the posterior margin of the head and the funicular joints 2—10 are scarcely longer than broad. The sculpture is only superficially like that of *mesosternalis* and *vexillarius*. The mandibles are very sparsely punctate, the clypeus sharply longitudinally rugose, the umbilicate foveolæ of the head, though deep, are further apart, so that they are separated by smooth spaces, except on the cheeks; on the thorax the foveolæ are confined to the dorsal portion of the pronotum and base of the epinotum and are absent on the pleuræ. On the pro- and mesonotum they are rather shallow. The petiole is also indistinctly foveolate or coarsely reticulate-rugose posteriorly and on the sides. The gaster, scapes and legs are finely and densely shagreened and very sparsely punctate. Hairs erect, very sparse, distinct only on the body. Color black, with red appendages or red throughout.

I have seen 13 specimens of this species, 8 in the Geolog. Inst. Koenigsberg Coll. (XXB 1194, B 11757, XXB 1038 and 5 without numbers), 4 in the Klebs Coll. (K 5101, K 4782, K 4206 and K 2613) and one in the Wm. Haren Coll. (415). Most of these are in a beautiful state of preservation and show the finest details of structure and sculpture very clearly.

Dolichoderus (Hypoclinea) tertiarius (Mayr) (Fig. 39).

Hypoclinea tertiaria Mayr, Beitr. Naturk. Preuss. I, 1868, p. 62, Taf. IV, Figs. 56 bis 60, ☿♀♂.

Dolichoderus tertiarius Forel, Bull. Soc. Vaud. Sc. Nat. (2) XV. P. 80, 1878, p. 386; Dalla Torre, Catalog. Hymen. VII, 1893, p. 163; Ern. André, Bull. Soc. Zool. France, XX, 1895, p. 82; Handlirsch, Foss. Insekt. 1908, p. 870.

Mayr described the worker, female and male of this species in considerable detail. Concerning the male there was some doubt in Mayr's mind, but he referred it to this species, because it agreed with the worker in size and sculpture. The worker is very much like that of *D. sculpturatus* in size and shape but the sculpture is very different. The head, pro- and mesonotum are smooth and finely shagreened and lack the deep umbilicate foveolæ of *D. sculpturatus*, although the cheeks are coarsely and sparsely punctate and the pro- and mesonotum also have a few scattered punctures. The meso-epinotal constriction and petiole are longitudinally rugose and the base of the epinotum is covered with shallow foveolæ, especially on the sides. The sculpture of the female is very similar but the base of the epinotum is deeply foveolate, except in the middorsal region where there is a smooth, sub-elliptical area.

D. tertiarius is by far the most abundant species of *Dolichoderus* in the amber. MAYR studies 87 specimens, ERN. ANDRÉ 38. I have seen 369 distributed as follows: 31 workers, 6 females and two males in the KLEBS Coll. (K 425 K 4266, K 1685, K 4207, K 7537, K 3536, α 170, etc.); 7 workers in the WM. HAREN Coll. (1894, 2412, 2441, etc.) and 339 workers, 18 females and 4 males in the Geolog. Inst. Koenigsberg Coll. (XXB 7131, B 18346, B 5358, B 5355, XXB 1034, B 19089, B 18443, B 5490, B 5479, XXB 412, etc.). In addition to all these specimens I have examined in the same collection the following types of MAYR: 3782/130, 3786/134, 3788/136, 3792/140, 3846/194, 7524/238, 7591/305, 7641/355, 7648/362, 7674/388, 7719/433, 8716/466, 8746/496, 8751/501, 8764/514, 8768/518, 9778/571.

Fig. 39. *Dolichoderus (Hypoclinea) tertiarius* MAYR. Worker, B 1527.

It is interesting to note that *D. tertiarius* is very closely related to the only species of the genus now occurring in the holarctic region, namely *D. 4-punctatus* L. of Central and Southern Europe, Asia Minor and Siberia, and *D. mariæ* FOREL, *plagiatus* MAYR and *taschenbergi* MAYR of North America. *D. sculpturatus*, though more heavily sculptured than any of these, also belongs to the same group.

Dolichoderus (Hypoclinea) longipennis MAYR.

Hypoclinea longipennis MAYR, Beitr. Naturk. Preuss. I, 1868, p. 67, Taf. IV, Fig. 65 ♂;
Dolichoderus longipennis FOREL, Bull. Soc. Vaud. Sc. Nat. (2), XV P 80, 1878, p. 386. DALLA TORRE, Catalog. Hymen. VII, 1893, p. 159; HANDLIRSCH, Foss. Insekt. 1908, p. 869.

MAYR based this species on two males, which differed from the males attributed to *D. tertiarius* mainly in having longer wings and in the more slender antennæ. I have seen no specimens of this species either in the KLEBS or Geolog. Inst. Koenigsberg Coll.

Tribe Tapinomini EMERY.

Genus *Iridomyrmex* MAYR.

Iridomyrmex geinitzi (MAYR) (Fig. 40 and 41).

Hypoclinea Geinitzi MAYR, Beitr. Naturk. Preuss. I, 1868, p. 58, Taf. III, Figs. 47 bis 49, ☿♀♂.

Bothriomyrmex geinitzi DALLA TORRE, Catalog. Hymen VII, 1893, p. 170; ERN. ANDRÉ, Bull. Soc. Zool. France XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908 p. 871.

This species is not a *Bothriomyrmex* but a typical *Iridomyrmex* very closely resembling in the form of the body certain Australian species, notably *I. rufoniger* Lowne, as Mayr observed. It has well-developed 6-jointed maxillary and 4-jointed labial palpi and the anterior clypeal border is sinuately excised in the middle whereas in *Bothriomyrmex* the maxillary palpi are 4- or 2-jointed, the labial 3- or 2-jointed and the clypeal border is entire.

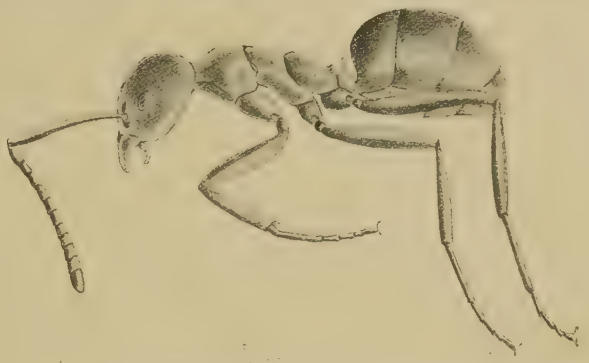

Fig. 40. *Iridomyrmex geinitzi* Mayr. Worker, B 18464.

Mayr's description and figures enable one to recognize all three phases of *I. geinitzi* without difficulty. This ant is one of the most abundant in the Baltic amber and therefore rarely lacking even in small collections. Mayr examined 168 specimens, Ern. André 80, I have seen in all 1041 specimens, which are distributed as follows: 796 workers, 3 females and 6 males in the Geolog. Inst. Koenigsberg Coll. (B 19204, XXB 395, XXB 6640, B 27542, B 550, B 7175, B 11754, XXB 56, XXB 388, B 18447, B 18985, B 5256, etc.) and 12 larvæ and pupæ, in all probability belonging to this species (B 18364, B 18125, B 18313 and several without numbers); 199 workers, one female and 5 males in the Klebs Coll. (K 2635, K 5591, α 91, α 117, K 5622, K 6407, K 1038, K 4516, K 1086, K 1743, etc.), one worker in the Brussels Museum, 15 workers in the Berlin Museum (242, 276, 281, 303, 312, 304, 307, 295) and 13 workers in the Wm. Haren Coll. (265, 1438, 1665, 1692, 1650, 2433, etc.) In addition to these, and not included in the number 1041 recorded above, I have found in the Geolog.

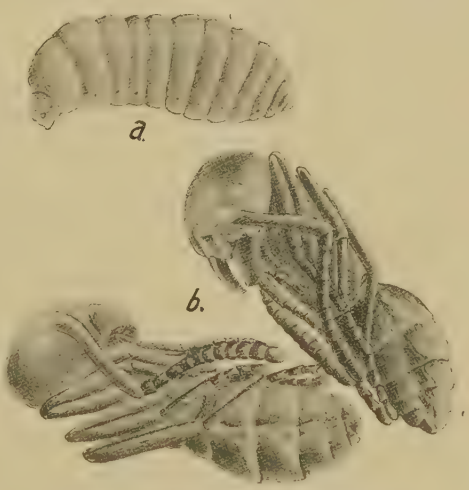

Fig. 41. *Iridomyrmex geinitzi* Mayr.
a) larva; b) two pupae, B 19874.

Inst. Koenigsberg Coll. 61 of the 66 specimens, including the types, recorded by MAYR as belonging to the Physical Economic Society Collection. One large piece of amber in this collection (without a number) contains at least 20 workers of *I. geinitzi.*

The pupæ which I have referred to this species are naked, showing that the larval habit of spinning a cocoon before pupation, still preserved in the *Ponerinæ* and most *Camponotinæ* down to the present day, had been abandoned by the *Dolichoderinæ* as long ago as Oligocene times.

Iridomyrmex constrictus (MAYR).

Hypoclinea constricta MAYR, Beitr. Naturk. Preuss. I, 1868, p. 60, Taf. III, Figs. 50. 51 ,☿♂.

Bothriomyrmex constrictus DALLA TORRE, Catalog. Hymen VII, 1893, p. 170; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 870.

This species, too, is a true *Iridomyrmex,* with 6-jointed maxillary and 4-jointed labial palpi, although the former are shorter than in *I. geinitzi.* It also resembles rather closely certain Australian species of the genus, notably *I. itinerans* LOWNE, *gilberti* FOREL and *innocens* FOREL. The worker of *I. constrictus* is readily distinguished from that of *I. geinitzi* by the shape of the thorax. The mesoëpinotal constriction is much more pronounced, the epinotum is short and convex and when seen in profile its base and declivity meet at a right angle, the base rising obliquely upward and backward from the constriction. The base is straight in profile, the declivity longer and slightly concave. The whole body in *I. constrictus* is stouter and less graceful than in *I. geinitzi,* and the antennæ are shorter, the scapes barely surpassing the posterior border of the head, the basal funicular joint is fully 3 times as long as broad, the second joint twice as long as broad, the remaining joints, except the last, about $1^1/_2$ times as long as broad. The mesoëpinotal constriction is longitudinally rugose. The body is rather abundantly hairy, the antennal scapes with a few erect hairs on their anterior surfaces as well as at their tips.

MAYR described as a gynandromorph („Zwitter") of this species a very interesting specimen, No. 7595/309, in the Geolog. Inst. Koenigsberg Coll. This specimen which I have examined and represent in the accompanying outline figure (Fig. 42) must however, I believe, be regarded as an ergatomorphic male like those found among certain recent species of the genera *Ponera, Cardiocondyla, Formicoxenus, Symmyrmica* and *Technomyrmex.* The general structure of the head,

thorax and gaster is like that of the worker, though the base of the epinotum is less convex and less abruptly elevated, so that the angle between it and the declivity is less pronounced in profile. Mayr does not mention that the eyes are decidedly larger and more convex than in the worker. There are a few small white spots or bubbles on the vertex which resemble small ocelli, but these organs seem to be actually absent. The antennæ are 13-jointed and very long; the scapes, however, are like those of the worker but extend well beyond the posterior borders of the head whereas joints 2—11 of the funiculi are cylindrical, subequal and fully 3 times as long as broad, the terminal joint being somewhat longer than these, the first shorter. In the gaster, which is shaped as in the worker, there are 5 indistinctly visible segments, and the tip shows clearly the small hairy, external genital valves (stipites) of the male. The legs are also longer and more slender than in the worker. The shape of the head and antennæ in this specimen shows that it is an ergatomorphic male of the extreme type such as is found in *Formicoxenus nitidulus* and *Ponera punctatissima*. This is interesting as demonstrating that a type of male, which we should naturally regard as a very modern development, had already made its appearance in the early Tertiary.

Fig. 42. *Iridomyrmex constrictus* Mayr. Ergatomorphic male. Type, 7595/309.

Mayr examined 10 specimens of *I. constrictus,* Ern. André 3. I have seen 57 specimens, distributed as follows: 51 in the Geolog. Inst. Koenigsberg Coll. (XXB 1794, B 5058, B 18 936, B 18 300, B 19 936, B 19 051, XB 670, XXB 1342, XXB 981, XXB 1027, XXB 1303 etc.), 3 in the Klebs Coll. (K 4049, K 3717, K 1730), one in the Berlin Museum (283) and two in the Wm. Haren Coll. (862 and 2168). In addition to these I have also examined the four types of Mayr in the Geolog. Inst. Koenigsberg Coll. (7650/309 (ergatomorphic male),

7650/364, 7699/413, and 979/583 and, in the same collection, two specimens (7517/231 and 9649/558), which he doubtfully referred to this species.

Iridomyrmex gœpperti MAYR.

Hypoclinea göpperti MAYR, Beitr. Naturk. Preuss. I, 1868, p. 56, Taf. I, Figs. 3—7, Taf. III, Figs. 42—46, ☿ ♀ ♂.

Bothriomyrmex göppertii DALLA TORRE, Catalog. Hymen. VII, 1893, p. 170; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 871.

I was at first inclined to adopt the view of DALLA TORRE and subsequent writers that this ant is a true *Bothriomyrmex,* but a closer study convinces me that it is more probably an *Iridomyrmex.* The thorax of the worker, to be sure, is much like that of *Bothriomyrmex* in having a rather feeble constriction in the mesoëpinotal region, but this is also the case in certain species of *Iridomyrmex,* notably in the North American *I. analis* ERN. ANDRÉ. The head of the amber species is certainly not like that of any existing species of *Bothriomyrmex* known to me, but narrowed anteriorly, with slightly concave cheeks and its posterior portion is broad and subcordate as in most species of *Iridomyrmex.* Moreover, the maxillary palpi are 6-jointed, the labial palpi 4-jointed, and there is considerable variation in stature just as there is in some recent species of *Iridomyrmex.* This latter character and also certain peculiarities of the head, especially of the clypeus, with its straight anterior border and the inflated, slightly projecting sides, especially in large specimens, together with the obsolescence of the sutures between the clypeus and head and the absence of a distinct frontal area and frontal groove, recall the conditions in the genus *Liometopum.* MAYR gives the length of the worker as 3,4—6 mm. I regard the later measurement as excessive and as probably referring to other species of *Iridomyrmex,* probably *I. samlandicus,* which may have been confounded with the species under discussion. It is not improbable, however, that *I. gœpperti* represents an ancestral and generalized form from which both *Bothriomyrmex* and *Liometopum* have been derived, the former by a reduction of the number of palpal joints, the latter by an increase in the stature variability of the worker and of the pilosity and pubescence of the body.

As MAYR has adequately figured and described all three phases of *I. goepperti* I will here omit a detailed description. It is far and away the most abundant and dominant ant in the amber fauna. MAYR examined 580 specimens, ERN. ANDRÉ 309. I have seen 4539 specimens which are distributed as follows: 3686 workers and 2 fe-

males in the Geolog. Inst. Koenigsberg Coll. (XXB 626, XXB 52, XXB 112, XXB 117, B 18750, XXB 1118, B 18645, XXB 7118, XXB 137, B 18934, B 18812, B 27286, B 19441, XXB 1110, XXB 1114, B 19744, XXB 761, XXB 1531, B 18367, B 1845 etc), 650 workers, 2 males and 2 females in the KLEBS Coll. (K 1749, K 4244, K 4287, K 2631, K 1757, K 859, K 1734, K 5784, K 941, K 3699, K 1441, K 3545, K 1745, K 2624, K 2660, K 4492, K 1027, K 4058, K 4468 etc.), 4 workers in the Brussels Museum, 46 workers and one male in the Berlin Museum (240, 243, 247, 251, 257, 258, 294, 308, 314 etc.) and 73 workers and one male in the Haren Coll. (67, 104, 134, 291, 337, 859, 488, 980, 983, 1841 etc.). In addition to these 4539 specimens I have examined 174 of the 268 specimens recorded by MAYR as belonging to the Physical Economic Society Collection (to day the Geolog. Inst. Koenigsberg Coll.), including the types of the worker and female. The male type, which I have not seen, was in the MENGE Coll.

The occurrence of 2—4 specimens of *I. goepperti* in single pieces of amber is not uncommon, and occasionally the number of individuals thus enclosed is much greater. Thus in the KLEBS Coll. there are the following inclusions: K 108 with 9 workers, K 4168 with 12, K 886 with 15, K 828 with 15 and K 839 with 20 workers. And in the Geolog. Inst. Koenigsberg Coll. three blocks without numbers contain 27, 28 and 50 workers respectively. The great abundance of this ant is also attested by the fact that it often occurs in the same block with other species, especially with *Lasius schiefferdeckeri* and *I. geinitzi*.

In the Geolog. Inst. Koenigsberg Coll. there is one block of amber (without a number) containing a worker *I. goepperti* with its larvae and another block in the same collection (also without a number) encloses 13 workers mingled with a number of Aphids!

These various specimens seem to me to show conclusively that *I. goepperti* was everywhere abundant in the amber forests, that it formed populous colonies, whose workers foraged in files and attended plant-lice on the oak and *Pinites* trees, much as the species of *Liometopum* of the present day forage on the conifers and oaks in the western United States, and on the oaks in Austria, Italy and the Balkan Peninsula.

Iridomyrmex samlandicus, sp. nov.

Worker. (Figs. 43 u. 44.) Length 5,5—6 mm.

Head, excluding the mandibles, about as long as broad, convex above, broadest in the middle, narrower in front than behind, with

flattened cheeks, broadly rounded, but distinct posterior corners and concave posterior border. Eyes large but flattened, a little in front of the middle of the sides of the head. Frontal area and groove indistinct; frontal carinæ long, straight, subparallel. Mandibles moder-

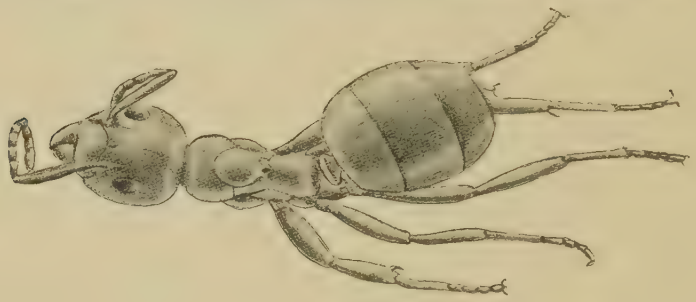

Fig. 43. *Iridomyrmex samlandicus* sp. nov. Worker, from above.

ately large, with sinuately concave external borders, their apical borders with about 8 denticles and with a few more indistinct teeth on the basal border. Clypeus flat, slightly convex in the middle behind, with broadly and sinuately excised anterior border. Maxillary palpi 6-jointed, extending back to the middle of the gula; labial palpi 4-jointed. Antennæ rather stout; scapes curved at the base, their tips scarcely extending beyond the posterior border of the head; joints 1—4 of the funiculus twice, remaining joints, except the last, only about $1^1/_2$ times as long as broad. Thorax long, narrower than the head, broadest through the pronotum which is flattened above and on the sides, without humeral angles, broader than long. Mesonotum distinctly convex, nearly circular, rising slightly above the pronotum in profile. Mesoëpinotal constriction distinct but not ridged longitudinally. Epinotum in profile with subequal base and declivity, each rather flat, meeting at a blunt obtuse angle, with prominent

Fig. 44. *Iridomyrmex samlandicus* sp. nov. a) Worker; b) head of same from above.

spiracles situated at the angles on the sides. The sides of the epinotum are flattened so that the base when seen from above is subobblong, a little broader behind than in front. Petiole very short and rather broad, its node high, scarcely inclined forward, much compressed anteroposteriorly and with a sharp upper border, which is rounded, though not broadly so, when seen from behind. Gaster large, scarcely over-hanging the petiole with its base.

Shining; head and thorax finely punctate or coarsely shagreened; gaster, legs and scapes more delicately shagreened. Mandibles very coarsely punctate, clypeus delicately and longitudinally striated on the sides; posterior portions of epinotal declivity transversely rugose.

Pilosity feebly developed; erect hairs lacking on the upper surface of the body, including the gaster, sparse on the venter, coxæ, mandibles and clypeus; appendages, except the tips of the scapes and femora, without erect hairs, apparently covered with very short, delicate pubescence.

Actual color black; in some specimens with reddish legs or antennae.

Described from 82 specimens; 73 in the Geolog. Inst. Koenigsberg Coll (B 5390, XXB 508, IIB 273, XXB 536, XXB 451, B 19396, B 5311, B 18679, XXB 429, XXB 1074, B 18802, B 19143, B 18652, B 18735, XXB 7173, XXB 414, XXB 564, B 5404, XXB 1099, B 19009, XXB 1910, B 19994, B 5067, XXB 1421, B 5482, B 18290, XXB 1112, B 18196, B 19223, B 18607, B 19503, XXB 271 etc.) and 9 in the Klebs Coll. (K 3704, K 4310, K 1731, K 3694, K 1045, α 87, α 134, α 51, α 28). Many of these are in an excellent state of preservation though frequently covered with delicate silvery air-films. The block XXB 508 contains also an aphid; block XX B 273 contains a worker of *I. geinitzi* with three workers of *I. samlandicus* and block XXB 1910 contains 4 specimens of the latter species.

I. samlandicus is most nearly related to *I. constrictus* and *I. geinitzi* but is easily distinguished from both by the structure of the thorax and petiole.

Iridomyrmex oblongiceps sp. nov.

Worker (Fig. 45). Length nearly 5 mm.

Head, excluding the mandibles, a little longer than broad, subrectangular, with straight parallel sides and broadly excised posterior border. Gula concave in the middle, upper surface of head rather flat. Eyes large, convex, in front of the middle of its sides. Mandibles and clypeus in an unfavorable position for study. Labial palpi

4-jointed, maxillary palpi long, evidently 6-jointed, but the terminal joints are lacking. Antennæ robust; scapes reaching to the posterior corners of the head; first funicular joint twice as long as broad, second joint $1^1/_2$ times, and the remaining joints, except the last, scarcely longer than broad. Thorax long and slender, narrower than the head, broadest through the pronotum, which is fully as long as broad. Mesonotum not convex, somewhat shorter than the pronotum, longer than broad, a little narrower behind than in front and on the sides not separated by sutures from the episterna. Mesoëpinotal con-

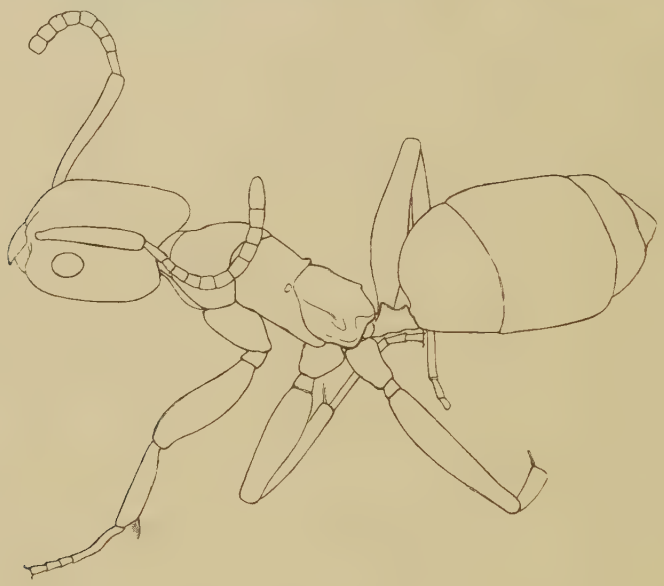

Fig. 45. *Iridomyrmex oblongiceps* sp. nov. Worker. B 5385.

striction short and distinct, not deep, nor with the metathoracic spiracles approximated in its dorsal concavity. Epinotum long, flattened and laterally compressed, its base scarcely convex, longer than the declivity. The latter is sloping and has an inverted V-shaped concavity, the arms of which extend over onto the episternal angles and there run forward to a tapering point on each side. Petiole small, not higher than long, its node inclined forward, pointed above, with a rather sharp border and flat posterior surface. Gaster large, its base overhanging the petiole. Legs long and stout, the femora, especially, being unusually robust.

Shining; the whole body, including the scapes and legs beautifully shagreened, the head and thorax reticulately, the gaster transversely.

Hairs delicate, sparse, erect, present only on the mandibles, clypeus and posterior portion of the gaster.

Color black.

Described from a single specimen (B 5385) in the Geolog. Inst. Koenigsberg Coll. It is in a beautiful state of preservation in clear amber, and with the exception of the anterior portion of the head, in a very favorable position for study.

This ant does not seem to be a typical *Iridomyrmex,* but I know of no other genus to which it can be assigned, and it does not seem advisable to erect a new one for its accomodation, since none of the characters in which it departs from the other species of *Iridomyrmex* is very prominent. From all of the previously enumerated amber species it is distinguished by its subrectangular head and the peculiar shape of its thorax and petiole.

Genus ***Liometopum*** Mayr.

Liometopum oligocenicum, sp. nov.

Worker (Fig. 46). Length 5,2 mm.

Head, excluding the mandibles, a little longer than broad, broader behind than in front, with rounded posterior corners, concave posterior and feebly convex, lateral borders. Eyes in front of the middle of the head. Ocelli small, but distinct. Mandibles with convex lateral borders, somewhat flattened upper surface and 8—9-toothed apical borders. Clypeus flattened, with the anterior border straight in the middle, projecting and slightly swollen on each side. Maxillary palpi long, 6-jointed, labial palpi 4-jointed. Antennæ rather stout, the tips of the scapes reaching nearly to the posterior corners of the head; joints 2—9 of the funiculi as broad as long, first joint fully twice as long as broad, second joint somewhat shorter. Thorax rather long, with longer and more angular epinotum and more distinct epinotal suture than in the recent species of the genus. Petiole as in the recent *L. apiculatum* Mayr, with the node inclined forward and pointed above. Gaster moderately large, elliptical and somewhat flattened dorsoventrally. Legs stout.

Mandibles very coarsely punctate. Body and appendages opaque, without distinct sculpture, but apparently very finely punctate or shagreened.

Erect hairs sparse, visible on the head, thorax and gaster. Pubescence very short, but dense, visible on the legs, antennæ and many portions of the trunk.

Dark reddish brown; mandibles, corners of clypeus, antennæ, tibiæ and tarsi paler and more yellowish.

Described from two specimens in the KLEBS Coll., K 775 (type) and K 1093. The former is broken at the petiole and has the gaster

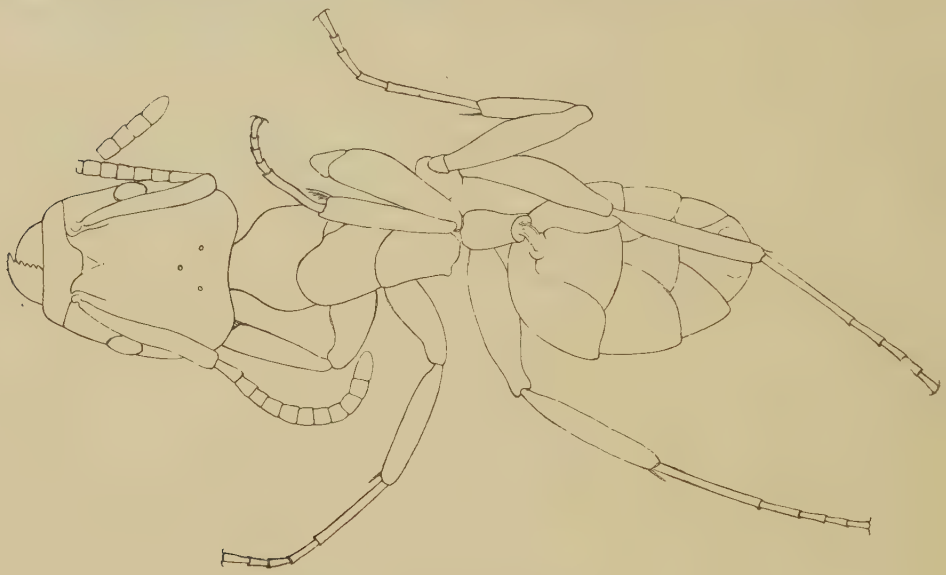

Fig. 46. *Liometopum oligocenicum* sp. nov. Worker. K 775.

turned upside down. Though in clear amber, the lower surface of the head and thorax and dorsal surface of the gaster are somewhat obscured by a white film. The latter specimen is more decomposed.

There can be no doubt that this species is a true *Liometopum*, though the thorax is longer, less convex above and with a more distinct mesoëpinotal constriction than in any of the recent species. The pubescence is also much shorter than in these forms, but its feebler development may be merely apparent and due to the effect of the medium in which the specimens are embedded.

Genus ***Asymphylomyrmex*** gen. nov.

Worker. Monomorphic. Body short and thick-set. Head suborbicular, slightly flattened anteriorly, with the eyes on its sides, behind the middle. Ocelli present, rather far apart. Clypeus large, convex, with somewhat projecting, sinuately excised anterior border. Frontal area large, triangular. Frontal groove very distinct, extending back to the anterior ocellus. Antennæ 12-jointed, their funiculi feebly enlarged towards the tip, without a differentiated club. Mandibles

rather slender, with oblique, dentate blades. Maxillary palpi 4-jointed, labial palpi 3-jointed. Thorax short and compact, broadest and highest through the posterior portion of the pronotum and the anterior portion of the mesonotum, which is separated from the pronotum by a distinct suture and slopes back gradually to the mesoëpinotal constriction which is long and shallow. Metathoracic spiracles neither protuberant nor approximated dorsally. Epinotum unarmed, short and rounded, without distinct base and declivity. Petiole with a large, erect, transverse node. Gaster large, very convex dorsally, not overhanging the petiole with its base. Middle and hind tibiæ without spurs; claws simple.

Asymphylomyrmex balticus, sp. nov.

Worker (Fig. 47). Length about 3 mm.

Head as broad as long, circular, except for the posterior border which is straight. Eyes rather large, moderately convex. Clypeus convex in the middle, depressed at the corners, its anterior border deeply and narrowly excised in the middle. Mandibles with their external borders straight at the base, convex at the tips; apical border with a large terminal tooth, a small tooth near the middle of the border and the basal portion finely denticulate. Antennæ rather stout; scapes reaching 2—3 times their diameter beyond the posterior border of the head; first funicular joint twice as long as broad, remaining joints, except the last, subequal, a little longer than broad. Thorax in profile with the pronotum convex, the mesonotum anteriorly convex and rising a little above the pronotum, then flattened and sloping behind to the rather long, shallow mesoëpinotal constriction. Epinotum convex and rounded. Petiole higher than long, robust, its node as high as the epinotum, blunt above, where it is nearly as thick as it is below, a little broader than long, with convex anterior and posterior surfaces. Segments of the gaster large and convex; the tip turned under and not visible from above. Legs stout.

Fig. 47. *Asymphylomyrmex balticus,* sp. nov. Worker, K 4305.

Mandibles finely striated and coarsely punctate; head thorax and gaster subopaque, densely and finely punctate; legs and scapes coarsely punctate.

Erect hairs very few and widely scattered on the body, short and more numerous on the gaster; tibiæ and tarsi with a row of slanting bristles on their flexor surfaces. Gaster, scapes and legs covered with short, dilute pubescence.

Color ferruginous red.

Described from ten specimens. Three of these, K 4305 (type), and K 5590, are in the KLEBS Coll. K 4305 is very transparent amber but is in such a position that parts of the head cannot be seen. The block K 5590 contains two workers which are curled up and much obscured by white films. One of them, however, shows the dorsal surface of the head very clearly. The 7 remaining specimens are in the Geolog. Inst. Koenigsberg Coll. (XXB 264, B 19509, B 19413. XXB 4358, B 19036 and two without numbers). Several of these are either in unfavorable positions or more or less clouded but they can be nevertheless definitely assigned to this species.

I have deemed it necessary to establish a new genus for this ant, because the shape of the head and thorax, and the absence of spurs on the middle and hind tibiæ remove it from any of the described Dolichoderine genera. The absence of these spurs and the abbreviation of the palpi show that it is a highly specialized form which became extinct without leaving any descendants to come down to recent times.

Tribe Pityomyrmecini, trib. nov.

Genus *Pityomyrmex*, gen. nov.

Worker. Body slender, with very long legs and antennæ. Head about as long as broad, nearly as broad in front as behind, with straight sides and rounded convex posterior border. Clypeus large, with broadly rounded, entire anterior border. Eyes rather large and convex, apparently behind the middle of the sides of the head. Ocelli absent. Mandibles inserted far apart at the anterior corners of the head, triangular but very long and slender, their blades fully 4 times as long as broad. The external and apical borders are rather straight except at the tip, where both are slightly curved, the apical, which is separated from the basal border by a sharp angle, is furnished with numerous subequal denticles. Maxillary palpi long, 6-jointed. Antennæ probably 12-jointed, the funiculus but slightly enlarged at the tip, consisting of joints much longer than broad and without a differentiated club. Thorax long and narrow, somewhat resembling that of *Paraneuretus;* the pro-, meso- and epinotum seen from above subequal, the pro- and epinotum both convex, especially the latter,

and of the same breadth, the mesonotum constricted and narrower, except in the middorsal region at the anterior end where it is convex. Metathoracic spiracles near the posterior end of the mesonotum, approximated in the dorsal concavity. Petiole much longer than broad, pedunculate in front, with a small node near its posterior end, lower than the length of the segment. Gaster rather large, elliptical. Sting not visible. Middle and hind tibiæ with well-developed pectinated main spurs in addition to short, simple accessory spurs. Claws simple.

Pityomyrmex tornquisti, sp. nov.

Worker (Fig. 48). Length about 5,5 mm.

Denticles on apical mandibular border about 20. Antennal scapes reaching far beyond the posterior border of the head; first funicular joint shorter than the second, about $1^1/_2$ times as long as broad; remaining joints except the terminal of one of the antennæ wanting. Thorax somewhat narrower than the head. Petiole seen from above fully 3 times as long as broad, gradually increasing in breadth posteriorly, border of node transverse, rather sharp.

Body smooth, apparently very finely shagreened.

Erect hairs very sparse, visible only on the head and gaster.

Mandibles with numerous coarse hairs on their borders and dorsal surface.

Color brown, with golden reflections.

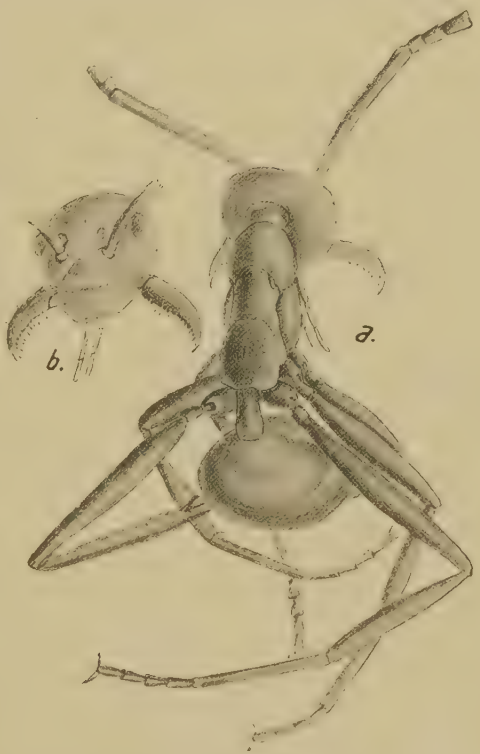

Fig. 48. *Pityomyrmex tornquisti* sp. nov.
a) Worker, SB 195, from above;
b) head of same from the front.

Described from a single specimen, without a number, in the Geolog. Inst. Koenigsberg Coll. This specimen is in a rather unfavorable position in a block of amber embedded in balsam in a glass cell and the head, gaster and much of the ventral surface of the insect are covered

with a wihte film. When the block of amber was trimmed and polished most of the joints of the antennœ were unfortunately cut away. The mandibles, however, are so unlike those of any other *Dolichoderinæ,* that I have had to make it the type of a new genus and new tribe. The thorax and petiole recall these parts in *Paraneuretus* but the resemblance in other respects seems to be merely superficial. The mandibles would seem to be adepted to some peculiar function, and their resemblance to the mandibles of *Polyergus* and *Strongylognathus* suggests that *Pityomyrmex tornquisti* may have been a parasitic or slave-making ant.

Subfamily Camponotinæ.

Tribe Plagiolepidini FOREL.

Genus *Plagiolepis* MAYR.

Plagiolepis succini ERN. ANDRÉ.

Plagiolepis succini ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895. p. 81, 83, ☿: HANDLIRSCH, Foss. Insekt. 1908, p. 859.

Worker. Length 4 mm.

Large, brownish black, with short, erect hairs. Antennæ stout, funicle clavate. Thorax constricted between the meso- and epinotum. Legs long and slender. Scape proportionally short, not surpassing the posterior border of the head; funiculus robust, very strongly and gradually thickened from the base towards the extremity, joints 3—4 transverse, the others about as broad as long, except the first, which is as long as the two following joints together, and the last, which is a little longer than the two preceding joints. Head of the same form as in *P. custodiens* SMITH, which lives today in South Africa; eyes rather large and situated near the middle of the sides of the head. Thorax with the pro-mesonotal suture wellmarked and rather strongly constricted above between the meso- and epinotum. Petiolar node moderately thick, inclined forward, its superior border very slightly excised. Legs rather long, slender. Body brownish black, with scattered, short, erect hairs, which are more oblique on the antennæ and legs. Sculpture not apparent.

ANDRÉ's description here translated is based on a single specimen. I have not been able to recognize the species in any of the material submitted to me. It is decidedly larger than any other *Plagiolepis* described from the amber and its close resemblance to the South African *P. custodiens* would seem to indicate that it may be a copal insect.

Plagiolepis klinsmanni Mayr.

Plagiolepis Klinsmanni Mayr, Beitr. Naturk. Preuss. I, 1868, p. 37, Taf. I, Figs. 19, 20, ☿.
P. klinsmanni Dalla Torre, Catalog. Hymen. VII, 1893, p. 172; Ern. André, Bull. Soc. Zool. France, XX, 1895, p. 82; Handlirsch, Foss. Insekt. 1908, p. 859.

This is by far the most common species of *Plagiolepis* in the amber. The worker is easily recognized by its pilosity, as not only the whole body but also the scapes and legs are covered with coarse erect or suberect hairs. Joints 2—6 of the funiculi are as long as broad or a little longer than broad, and the petiole has a low, thick, blunt node, which is a little broader than long. The body measures 2,5—3 mm.

I believe that I have seen the male of this species (K 1020 in the Klebs Coll.). It is precisely like the worker in color and size (2,5 mm) and the wings, though rather awkwardly glued together, have the typical *Plagiolepis* neuration. The terminal tarsal joints are large and dilated; the antennæ resemble those of the worker but are 12-instead of 11-jointed, and the funicular joints are longer.

I have seen 85 specimens of this species, distributed as follows: 74 workers in the Geolog. Inst Koenigsberg Coll. (B 18934, B 19071, XXB 855, B 18658, XXB 1328, XXB 273, B 19689, XXB 7205, B 5444, B 464, B 405, B 18172, XXB 1236, B 18156 etc.), one worker without a number in the Berlin Museum and 9 workers and one male in the Klebs Coll. (K 2649, K 947, α 93, α 16, α 210, K 4313, K 1458, K 4045, K 4262, K 1020). I have also examined Mayr's four types in the Geolog. Inst. Koenigsberg Coll. (7693/407, 9492/544, 3895/216, and 3769/117).

Plagiolepis künowi Mayr.

Plagiolepis Künowi Mayr, Beitr. Naturk. Preuss. I, 1868, p. 39, Taf. I, Fig. 22, 23. ☿.
P. Künowi Dalla Torre, Catalog. Hymen. VII, 1893, p. 172; Ern. André, Bull. Soc. Zool. France, XX, 1895, p. 82; Handlirsch, Foss. Insekt. 1908, p. 859.

This species is known only from the worker form, which is smaller than that of klinsmanni, measuring only 1,5—2 mm, and much less pilose, though it has a few suberect hairs on the antennal scapes. Joints 2—5 of the funiculi are much broader than long, and the petiolar node, though low and blunt, is proportionally much shorter and more compressed anteroposteriorly, than in *klinsmanni*.

I have seen 10 specimens of this ant, 5 in the Klebs Coll. (K 6404, K 6426, α 198, α 215, and α 216), one in the Brussels Museum and 4 in the Geolog. Inst. Koenigsberg Coll. (B 5258, B 19982, B 18931 and one without a number). I have also examined Mayr's type (3760/108) in

the latter collection. The specimen in the Brussels Museum is somewhat doubtfully referred to this species, and the same is true of B 19982, which lacks the antennal funiculi.

Plagiolepis squamifera MAYR.

Plagiolepis squmifera MAYR, Beitr. Naturk. Preuss. I, 1868, p. 40, Taf. I, Fig. 24, ☿: DALLA TORRE, Catalog. Hymen. VII, 1893; p. 173; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 859.

The worher of this form differs from that of *klinsmanni* in the shape of the thorax and petiole, the mesoëpinotal constriction being deeper and the epinotum more cuboidal and less rounded and the petiolar node much compressed anteroposteriorly so that it is high, thin and transverse, with a sharp border, which is feebly emarginate in the the middle. Joints 2—5 of the funiculi are about as long as broad. The pilosity is much as in *klinsmanni,* but the hairs seem to be a little finer and sparser.

Four specimens are referable to this species, 3 in the Geolog. Inst. Koenigsberg Coll. (B 5199, and 2 without numbers) and one in the KLEBS Coll. (K 905). The last is very defective as it lacks large portions of the legs and antennæ. MAYR's type (7521/235) in the Geolog. Inst. Koenigsberg Coll. is still in a fine state of preservation and in excellent position.

Plagiolepis singularis MAYR.

Plagiolepis singularis MAYR, Beitr. Naturk. Preuss. I, 1868, p. 38, Taf. I, Fig. 21, ☿: DALLA TORRE, Catalog. Hymen. VII, 1893, p. 173; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 859.

MAYR based this species on a single female specimen in the MENGE Coll. It might be regarded as the female of *P. klinsmanni* notwithstanding its length of about 5,7 mm, since the females of the recent species of *Plagiolepis* are often considerably larger than their workers, were it not that the pilosity is much less abundant and joints 3—5 of the antennal funiculi are much broader than long. I have not been able to find any specimens of this species in the collections I have studied. It is also possible that it is a species of *Drymomyrmex* (vide infra).

Plagiolepis solitaria MAYR.

Plagiolepis solitaria MAYR. Beitr. Naturk. Preuss. I, 1868, p. 40, ♂: DALLA TORRE, Catalog. Hymen. VII, 1893, p. 173; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt., 1908, p. 859.

This species was based by MAYR on a single male in the Coll. MENGE. He admits that it may belong to one of the preceding species

but owing to his inability to attach it to any of them, he described it as distinct. It has 12-jointed antennæ and measures only 3 mm.

Genus *Rhopalomyrmex* Mayr.

Rhopalomyrmex pygmœus Mayr. (Fig. 49.)

Rhopalomyrmex pygmœus Mayr, Beitr. Naturk. Preuss. I, 1868, p. 42, Taf. II, Fig. 25, 26, ♀; Dalla Torre, Catalog. Hymen. VII, 1893, p. 175: Ern. André, Bull. Soc. Zool. France, XX, 1895, p. 82; Handlirsch, Foss. Insekt. 1908 p. 859.

The genus *Rhopalomyrmex* was founded on this single species, which in turn was based on a single specimen (7576/290) in the Geolog. Inst. Koenigsberg Coll. This has since been mounted in a balsam cell and is in such a position that all its parts, except the anterior portion of the head, can be easily seen. I have found 12 specimens of this species, one in the Klebs Coll. (K 789) and 11 in the Geolog. Inst. Koenigsberg Coll. 10 workers (B 19096, B 19821, XXB 745 and 7 without numbers) and a single male (XXB 175). These are all beautifully preserved.

Fig. 49. *Rhopalomyrmex pygmaeus* Mayr. Worker, K 789.

As Mayr observed, *Rhopalomyrmex pygmœus* closely resembles *Plagiolepis künowi* and the living *P. pygmæa* Latr. but has 10-jointed antennæ and the four terminal joints forming a club, which, however, is not very sharply marked off from the remainder of the funiculus. These are really the only characters which separate the genus *Rhopalomyrmex* from *Plagiolepis*. From the neotropical genus *Myrmelachista* Roger, the workers of which also have 10-jointed antennæ, the amber genus is distinguished only by having a 4- instead of a 3-jointed antennal club. It is therefore doubtful whether *Rhopalomyrmex* is to be regarded as more than a subgenus of *Plagiolepis* or *Myrmelachista*.

What I take to be the male of *Rh. pygmœus* measures only 3 mm. The body is slender, both the thorax and gaster being long and narrow. The head is broader than the thorax, with moderately large eyes and

ocelli and 11-jointed antennæ. The scapes are long, reaching beyond the posterior corners of the head, the funicular joints subequal, fully 3 times as long as broad, the first joint not shorter, but a little more swollen than the succeeding joints, the terminal joint twice as long as the penultimate. Mandibles small, apparently dentate. Thorax elongate elliptical. Petiolar node low and rounded, transversely elliptical, a little broader than long. Genital appendages prominent, slender; stipites long, digitiform. Legs long and slender. The wings overlap oneanother on the back of the specimen and are so transparent as to show almost no traces of the venation. Both the discal and cubital cells seem to be absent. The stigma is large and triangular. The surface of the body, scapes and legs is shining and finely punctate; the hairs on the body and appendages are rather dense. very short and reclinate. The color of the specimen is dark brown.

Tribe Oecophyllini EMERY.

Genus *Dimorphomyrmex* ERN. ANDRÉ.

Dimorphomyrmex theryt EMERY. (Fig. 50.)

Dimorphomyrmex Theryi EMERY, Bull. Soc. Ent. France, 1905, p. 188, Fig. 1, ♀; HANDLIRSCH Foss. Insekt. 1908, p. 868; WHEELER, Psyche, XVII, 1910, p. 132.

Worker major and media. Length 6—8 mm.

Head a little longer than broad, subrectangular, a little narrower in front than behind, with straight sides, rounded posterior corners and feebly concave posterior border, not very convex above, flattened below. Eyes large and convex, elongate elliptical or slightly reniform, scarcely more than $^1/_3$ as long as the head and near the middle of the sides of the latter but not visible when the head is seen from below, slightly more approximated in front than behind. Ocelli present, at least in the worker major, possibly absent in the smaller mediæ. Frontal carinæ short but prominent, extending to the middle of the anterior orbits. Frontal area small and indistinct; frontal groove present but short and shallow. Clypeus flat, broader than long, its posterior border extending back medially between the frontal carinæ and with its rounded and entire or very feebly excised anterior border projecting in the form of a short broad lobe. Mandibles stout, broad at their insertions, with evenly convex external and 8—9-toothed apical borders, not decussating when closed. The teeth are stout and blunt, the apical longest but shorter teeth alternating with the longer towards the base. Antennæ short, 8-jointed; scapes not reaching to the posterior orbits, incrassated at their tips; joints 1 and 2

of the funiculi subequal, about twice as long as broad, joints 3 and 4 about $1^1/_2$ times as long as broad, 5 and 6 scarcely longer than broad, the terminal joint nearly equalling the two penultimate joints together. Palpi short, those of the maxillæ 6-jointed, those of the labium 4-jointed. Thorax long, narrower than the head, constricted in the mesoëpinotal region; pronotum as long as broad, with rounded, sloping humeri, feebly convex above. Mesonotum from above subrectangular, somewhat longer than broad and broader in front than behind; in profile its surface is straight and gradually sloping backward, its sides compressed. Metanotum distinct, short and transverse, marked off from the mesonotum by an impressed line or possibly, in the largest specimens by a distinct suture. Epinotum with subequal base and declivity, the former feebly convex, the latter slightly concave, meeting at a blunt obtuse angle. Petiole short, with a low, blunt and rounded node, which is somewhat compressed anteroposteriorly and about $1^1/_2$ times as broad as long. Gaster large, elongate oval, with 5 visible segments and a strongly developed circlet of anal cilia. Legs long and rather stout, middle and hind tibiæ with short, nonpectinated spurs.

Fig. 50. *Dimorphomyrmex theryi* Emery. a) Worker, K 4252; b) head of worker.

Body rather shining, head and gaster very finely, thorax more coarsely and reticulately shagreened or coriaceous. Mandibles, clypeus at least on the sides, cheeks and front between the eyes and about half way to the posterior border of the head, sharply and densely longitudinally striated; the mandibles also coarsely punctate.

Erect hairs absent or almost absent on all parts of the body except the posterior gastric segments where they are long and sparse. Funiculi with shorter, more numerous, appressed hairs.

Color of well preserved specimens red or black.

Worker minor. Length 5—5,5 mm.

Differing from the worker major in lacking the ocelli, in having the mesonotum less sharply marked off from the metanotum and in having the gaster less convex above and more tapering posteriorly. The head seems also to be smoother and more shining and the front less distinctly and less extensively striated.

I have redescribed this species in detail because the single worker seen by EMERY was rather poorly preserved and in an unfavorable position. The single known living species on wich ANDRÉ based the genus *Dimorphomyrmex, D. janeti,* occurs in Borneo and Sumatra. According to ANDRÉ, its workers are dimorphic, differing in the size of the head and body, the latter measuring 6 mm in the soldier and 3,5 mm in the worker. EMERY has given reasons for supposing that intermediate forms occur, so that the generic name is not very apt. The measurements of *D. theryi* given above, include also those for the forms which may be regarded as mediæ. The size of EMERY's specimen (between 5 and 5,5 mm) and its lack of ocelli shows that it was a minor or minim worker.

I have examined 36 specimens of *D. theryi*, which are distributed as follows: 25 in the Geolog. Inst. Koenigsberg Coll. (B 18900, B 18882, B 14186, B 19494, B 14128, XXB 2048, B 19056, B 19722, B 18757 (two specimens in one block), B 19097, B 18726, B 18992, B 5509, B 18416 and ten without numbers); 8 in the KLEBS Coll. (K 6397, K 4252, K 4442, K 779, α 21, α 185 and α 245), one in the Berlin Museum (313) and two in the Haren Coll. (976 and 1733). K 6397, which contains two workers, a major and a minor, side by side in the same block, has enabled me to correlate these two phases. In this specimen the major is in a very advantageous position and is beautifully preserved, but the front of the head of the minor is obscured by cracks in the amber.

Dimorphomyrmex mayri, sp. nov.

Worker (Fig. 51). Length about 6,5 mm.

Differing from *D. theryi* in the following particulars: The head is proportionally longer and narrower, with larger and more convex eyes; which are nearly half as long as the sides of the head. Ocelli lacking. Clypeus longer and more convex, its anterior lobe more projecting and rounded, the palpi and especially the mandibles decidedly longer, the latter being also more slender, with much less convex upper surfaces and external borders, and the two basal joints of the antennal funiculi are distinctly longer. Mesonotum larger and more convex, petiolar node proportionally broader and shorter, being more compressed,

anteroposteriorly. The punctures on the mandibles are finer and the frontal striæ do not extend as far back as in *D. theryi*. Otherwise the sculpture and the pilosity are much as in the latter species. Legs with very short, reclinate hairs. Color red.

Fig. 51. *Dimorphomyrmex mayri* sp. nov. Worker.

Described from a single beautifully preserved specimen (without a number) in the Geolog. Inst. Koenigsberg Coll. In my figure the eyes should be slightly reniform and somewhat more approximated in front.

Tribe Gesomyrmini Forel.

Genus *Gesomyrmex* Mayr.

Gesomyrmex annectens, sp. nov.

Worker (Fig. 52). Length 4—6 mm.

Body rather stout. Head longer than broad, about as narrow behind as in front, with convex sides and broadly and feebly excised posterior border. Cheeks and anterior corners of head well-developed. Eyes very large and convex, fully half as long as the head, reniform, somewhat approximated in front, situated in front of the middle of the head, only their external orbits visible when the head is seen from below. Ocelli small but distinct. Clypeus moderately convex, with a prominent rounded lobe, half as long as the remainder of the sclerite, projecting over the bases of the mandibles. Mandibles long and narrow, 9-toothed, their external blades rather straight at the base, convex apically. The teeth are of unequal length, long and short ones alternat-

Fig. 52. *Gesomyrmex annectens* sp. nov. Worker, B 1501.

ing, the long ones acute. Antennæ short, 8-jointed, the scapes not reaching to the posterior orbits, incrassated at their tips; joints 1 and 2 of the funiculi more than twice as long as broad, joints 3—6 longer than broad. Thorax shaped much as in *Dimorphomyrmex theryi;* pro- and mesonotum rather flat above, the latter compressed laterally, longer than broad, narower behind than in front and impressed, but without a suture, at its juncture with the metanotum. Epinotum with subequal base and declivity, the former rather convex, the latter feebly concave. Petiolar node shaped like that of *D. mayri,* rather high, compressed anteroposteriorly, more than twice as broad as long, with blunt, rounded border and flat anterior and posterior surfaces. Gaster and legs as in the two species of *Dimorphomyrmex*; middle and hind tibæ with very short, simple spurs.

Sculpture and pilosity as in the two species of *Dimorphomyrmex,* except that the longitudinal striation between the eyes is shorter and confined to the front.

Color yellow, red or blackish brown, according to the state of preservation.

Described from 23 specimens in the Geolog. Inst. Koenigsberg Coll. (XXB 1501 type, B 18734, XXB 561, XXB 1083, XXB 548, XXB 682, B 19222, XXB 1554, B 19988, B 19942, B 18429, B 5200, B 18539, XXB 1501, XXB 2048 and 9 without numbers). No. 168/21 of the same collection was mentioned by MAYR as belonging to *G. hoernesi* but it is really a specimen of *G. annectens*. One of the specimens is in the same block with a worker of *Iridomyrmex goepperti.*

Owing to the close resemblance of *G. annectens* to the preceding species of *Dimorphomyrmex* I was at first inclined to include it in that genus, but as its resemblance is greater, especially in the shape of the head, to *Gesomyrmex hoernesi*, it seemed best to place it with this species. I have also been led to adopt this course by a consideration of the only known living species, *G. chaperi,* which was described by ERN. ANDRÉ from Borneo many years after the genus had been founded by MAYR for the amber species, since this recent species is intermediate, so far as can be infered from ANDRÉ's figures, between *G. hoernesi* and *annectens* and certainly resembles the latter more closely in the greater width of the anterior border of the head and the greater development of the cheeks.

Gesomyrmex hoernesi MAYR. (Fig. 53.)

Gesomyrmex Hörnesi MAYR, Beitr. Naturk. Preuss. 1, 1868, p. 52. Taf. II, Fig. 38 bis 41, ☿♂.

Gæsomyrmex hörnesii Dalla Torre, Catalog. Hymen. VII, 1893, p. 176.
Gesomyrmex hörnesi Ern. André, Bull. Soc. Zool. France, XX, 1895, p. 82; Handlirsch, Foss. Insekt. 1908 p. 859.

Worker. Length 2,5—6 mm.

Body slender. Head, excluding the mandibles, a little longer than broad, as narrow behind as in front, with distinct but rounded posterior corners and straight or feebly excised posterior border, very short cheeks and convex vertex. The head is broadest through the eyes, which are even larger, more convex and more reniform than in *G. annectens,* being more than half as long as the head and more approximated anteriorly. They project beyond the lateral borders of the head when it is seen directly from below. Ocelli minute. Frontal area and frontal groove obsolete. Clypeus fully as long as broad, anteriorly projecting as a long, rather narrowly rounded lobe over the bases of the mandibles. The surface of the clypeus is convex posteriorly but its projecting border is flattened or slightly concave. Mandibles very long, decussating when closed, with 9 long, acute teeth, some of which are slightly shorter than others. The outer borders of the blades are straight at the base, then feebly concave just behind the convex tips which are bent downward. The basal border is nearly as long as the apical, the mandible being broadest where the two borders meet, although its breadth at this point is not more than a fifth of its total length. Palpi and antennæ more slender than in *G. annectens,* the scapes, which are somewhat incrassated at their tips reaching a little beyond the middle of the eyes; all the funicular joints longer than broad. Thorax very similar to that of *G. annectens* but more slender, the mesonotum longer and passing into the metanotum somewhat less abruptly. Petiole as long as broad, its node low, a little more than twice as broad as long, compressed anteroposteriorly, rounded and blunt above, with convex anterior and posterior surfaces. Gaster elongate elliptical with a circlet of coarse anal cilia. Legs rather slender.

Fig. 53. *Gesomyrmex hoernesi* Mayr. Worker, B 18396.

Sculpture, pilosity and coloration as in *G. annectens,* the longitudinal striation of the mandibles, cheeks, clypeus and front, however, more delicate.

Of this, the type species of the genus *Gesomyrmex*, MAYR mentions 19 workers, 6 of which (168/21, 273/36, 320/41, 7631/345, 7666/380 and 9361/539) belonging to the Geolog. Inst. Koenigsberg Coll., I have examined. One of these (7666/380), as previously stated, is a specimen of *G. annectens*. Besides these I have examined 112 workers of *G. hoernesi*, which are distributed as follows: 88 in the Geolog. Inst. Koenigsberg Coll. (B 14123, B 19762, B 27253, XXB 701, B 18982, B 5110, B 18859, XXB 1213, B 19313, B 18390, XXB 7048, XB 224, B 18690, XXB 64, XXB 899, B 18502, XXB 800, B 18190, B 19806 etc.), 20 in the KLEBS Coll. (K 4478, K 836, α 119, K 4466, α 111, K 2614, K 939, K 889, α 124, α 95 etc.), one in the Brussels Museum, one (265) in the Berlin Museum and 2 in the Haren Coll. (1498, 2646).

MAYR described what he took to be the male of this species from a single very poorly preserved specimen in opaque, brown amber (258/33 in the Geolog. Inst. Koenigsberg Coll.). After examining this specimen, which has probably deteriorated with time, I have nothing to add to the description. It still shows the shape of the mandibles, the enormous eyes, the short, 11-jointed antennæ, the long, linear external genitalia and the venation of the wings, with their discal, single cubital and closed radial cells. With the discovery of an additional species of *Gesomyrmex*, however, this male is not so clearly referable to *G. hoernesi* as it was in MAYR's day, and it is not impossible that it may even be the male of one of the two species of *Dimorphomyrmex* that have since come to light. Unfortunately this question cannot be settled till we obtain the hitherto unknown males of the recent species of *Gesomyrmex* and *Dimorphomyrmex*.

An interesting consideration is suggested by the four amber species of these two genera described above. It will be seen that they form a graded series in the order of their description. While the coloration, pilosity and, in its essential features, also the sculpture are the same in all four, the body dwindles in size, the eyes gradually increase in size and the clypeal lobe, palpi, mandibles and funicular joints increase in length as we pass from *D. theryi* through *D. mayri* and *G. annectens* to *G. hoernesi*. At first sight we might be tempted to regard all four of these forms as the workers of a single polymorphic species, but this is evidently not the case as shown by the worker minor of *D. theryi*. We may assume, therefore, that they represent four different stages in the early Tertiary evolution of two genera, *D. theryi* being the oldest and most primitive and *G. hoernesi* the most recent and dominant type. The existing species

D. janeti and *G. chaperi*, would, on this supposition represent relicts of this evolutionary process, which are today leading a precarious existence in the islands of the Malay Archipelago.

These considerations will explain why I cannot regard the separation by EMERY of the existing *Dimorphomyrmex* in a tribe distinct from the *Œcophyllini*, as satisfactory, for this genus is evidently closely related to *Gesomyrmex* as shown by *G. annectens* and this latter genus is generally recognized as closely related to *Œcophylla*. The separation was made by EMERY solely on the structure of the gizzard, but this single character, though important, can hardly be made to outweigh the numerous external resemblances between these three genera and the fact that they merge into one another so intimately.

Besides the two amber species described above, a third extinct species has been referred by EMERY to the genus *Gesomyrmex*. This is *G. corniger* of the Sicilian amber, which is of upper Miocene age. A study of EMERY's figures and description of this form, however, fail to convince me that it really belongs to MAYR's genus, although it is evidently an allied form. The shape of the head and thorax, which are both armed with long spines, the position and shape of the eyes and the dentition of the mandibles are so peculiar that in my opinion it should be regarded as the type of a new genus, for which I suggest the name ***Sicelomyrmex.*** This ant is evidently a much more highly specialized and geologically more recent form than *G. hoernesi* and suggests that the group of *Camponotinæ* with 8-jointed antennæ in the worker phase may have reached its highest development in the Miocene of Europe before becoming extinct on that continent. At the present time this group is represented merely by *G. chaperi* and *D. janeti* in Borneo and Sumatra and by two species of *Aphomomyrmex* (*A. andrei* EMERY and *A. hewitti* WHEELER) in the former island.

Genus ***Prodimorphomyrmex,*** gen. nov.

Worker. Related to *Dimorphomyrmex*. Head large, flattened, longer than broad, broader behind than in front, with straight sides and broadly excised posterior border. Eyes large, oval, but not reniform, narrower in front than behind, smaller than in *Dimorphomyrmex*, less than $^1/_3$ as long as the head, placed at the middle of its longitudinal diameter. Ocelli present, minute. Clypeus small, flat, its anterior border entire, broadly rounded, not projecting. Frontal carinæ distinct, widely separated, straight, diverging behind and ex-

tending back to the middle of the anterior orbits. Frontal area large, triangular, indistinct. Frontal groove distinct but not extending to the anterior ocellus. Mandibles small, convex, triangular, with 5 short, blunt, subequal teeth. Antennæ very short, 10-jointed, funiculi enlarged towards their tips but without a differentiated club. Palpi very short, the maxillary pair apparently 6-jointed. Thorax only about as long as the head including the mandibles, but narrower; prothorax much larger than the mesothorax and epinotum; metanotum well-developed, but very narrow; mesoepinotal constriction distinct. Petiole with a blunt, low, transverse node. Gaster large. Legs short; middle and hind tibiæ with very short, simple spurs; claws simple, well-developed.

Prodimorphomyrmex primigenius, sp nov.

Worker (Fig. 54). Length about 8 mm.

Antennal scapes short, slightly incrassated at their tips, which do not reach to the posterior orbits; first funicular joint twice as long as broad, second joint small, about as broad as long, joints 3 and 4 broader but not longer than the second, joints 7—8 nearly as broad as long, terminal shorter than the two penultimate joints together. Pronotum as long as broad, with rounded, sloping humeri, twice as broad as the mesonotum, both together feebly and evenly convex in profile; mesonotum seen from above longer than broad, broader in the front than behind, marked off from the small metanotum by a distinct suture, with compressed sides. Epinotum about as broad as long, broader behind than in front, rounded in profile, without a distinct base and declivity. Petiole small, a little broader than long, its node low, compressed anteroposteriorly, slightly inclined forward, its anterior and posterior surfaces rather flat, its border rather blunt and entire.

Fig. 54. *Prodimorphomyrmex primigenuis* sp. nov. Worker, 57.

Smooth and shining; anterior portion of head finely and very sparsely punctate; thorax and gaster under a lens of 20 diameters, very delicately shagreened. Mandibles punctate with 4 or 5 longitudinal furrows, most distinct at the dentate borders. Cheeks anteriorly, front and apparently also the sides of the clypeus very finely striated; cheeks also densely punctate.

Erect hairs very sparse, visible only on the mandibles, coxæ and front.

Color black; covered with a silvery air film.

Described from a single specimen, 57 in the KLEBS Coll. This specimen lacks the gaster behind the base of the first segment and has several air-bubbles on the surface and enveloping the clypeus and tips of the antennæ.

At first sight one would be inclined to regard this ant as a *Dimorphomyrmex*, but the distinctly 10-jointed antennæ, smaller eyes and differently shaped thorax remove it from this genus. It is equally difficult to assign it to the genus *Aphomomyrmex* EMERY, one of the African species of which, *A. afer* EMERY, has 9-jointed antennæ in the worker and 10-jointed antennæ in the female, because the frontal carinæ in this genus do not run to the anterior orbits but terminate on the front mesially of the eyes. I believe, therefore, that the amber form may be properly regarded as the type of a new genus which is more primitive than, though closely related to *Dimorphomyrmex*. I should, however, have placed *P. primigenius* in *Dimorphomyrmex* for the same reason that EMERY extended the scope of *Aphomomyrmex* to embrace *A. andrei* of Borneo with only 8-jointed antennæ, were it not that I believe that this species and the allied *A. hewitti* WHEELER of the same island, another form with 8-jointed antennæ in the worker and female, will probably have to be assigned to a new genus when more material of these and of the African species has been carefully studied.

Tribe Oecophyllini FOREL.

Genus *Œcophylla* F. SMITH.

Œcophylla brischkei MAYR. (Fig. 55.)

Œcophylla brischkei MAYR, Beitr. Naturk. Preuss. I, 1868, p. 31, Taf. I, Fig. 12, 13. ♀.
Œ. brischkei DALLA TORRE, Catalog. Hymen. VII, 1893, p. 176; ERN. ANDRÉ, Bull. Soc. Ent. Franee, XX, 1905, p. 83; HANDLIRSCH, Foss. Insekt. 1908, p. 860.

Worker. Length: 4,5—8 mm.

Head convex above, excluding the mandibles longer than broad, broader behind than in front, with rather straight sides and posterior

border and rounded posterior corners. Eyes large and very convex, at the middle of the sides of the head. Ocelli absent. Clypeus nearly as long as broad, its anterior margin rounded, projecting far beyond the anterior border of the head over the bases of the mandibles, convex but not carinate in the middle. Mandibles long, with the external borders straight at the base and the apical borders with about 9 large teeth alternating with nearly as many smaller ones; the apical teeth longer and more curved. Frontal area and frontal groove distinct; frontal carinæ short, subparallel, slightly diverging behind. Antennæ slender, 12-jointed, the scapes extending more than half their length beyond the posterior corners of the head, gradually incrassated towards their tips; funicular joints slender, gradually decreasing in length distally, joints 1 and 2 subequal and fully 4 times as long as broad, the penultimate joints scarcely twice as long as broad. Thorax long and slender, much like that of *Gesomyrmex*, but with deeper and longer mesoëpinotal constriction and longer pro- and epinotum. Petiole more than twice as long as broad, elongate elliptical from above, in profile bearing in its middle a low rounded node which is not compressed anteroposteriorly. Gaster short, elliptical. Legs long, with stout claws on the slightly enlarged terminal tarsal joints and feeble spurs on the middle and hind tibiæ.

Fig. 55. *Œcophylla brischkei* MAYR. Worker. B 18747.

Body, legs and scapes finely coriaceous or shagreened and very sparsely and finely punctate. Mandibles and clypeus finely, longitudinally striated, the former also with coarse, sparse punctures.

Hairs very sparse, erect, visible only on the mandibles, on the venter and posterodorsal portion of the gaster. Apparently also the body in life was covered with fine dilute pubescence, but traces of this are distinctly seen only on the head of some of the specimens.

Color varying from red to black; the darker specimens often showing signs of considerable decomposition.

Male. Length about 8 mm; length of fore wing 10 mm.

Head small, including the eyes broader than long, with large convex eyes and ocelli. Mandibles long, narrow, spatulate, edentate and rather blunt at their tips. Antennæ short and slender, 13-jointed; scapes but slightly enlarged towards their tips and reaching only about $^1/_3$ their length beyond the posterior border of the head; joints of funiculus decreasing rapidly in length distally, joints 1 and 2 subequal in length but the former thicker, so that the first is about 3, the second about 4 times as long as broad, penultimate joints scarcely longer than broad, terminal joint as long as the two preceding together. Thorax large and robust, through the wing insertions more than twice as broad as the head, with very large and somewhat flattened mesonotum and scutellum and the pronotum so much reduced in length as to be invisible when the insect is seen from above. Petiole stout, about twice as long as broad, a little broader behind than in front, with an angle in the middle on each side and a low rounded node. Gaster elliptical, broad and flattened above. External genitalia very small, stipites very short, bluntly pointed, volsellæ longer but not clearly visible. Legs very long and slender, terminal tarsal joints and claws large. Wings very large and ample, longer than the body. Veins strongly marked, discal cell absent.

Sculpture and pilosity much as in the worker.

Color black or dark brown, with paler appendages.

This species was described by Mayr from 5 worker specimens, one each in the Berlin Museum, Berendt, Brischke, Menge and Mayr Collections. I have seen 45 specimens distributed as follows: 36 workers and 2 males in the Geolog. Inst. Koenigsberg Coll. (B 14166, B 14192, B 27279, B 18484, B 14342, B 18747, XXB 1972, B 5254, XXB 1505, B 5192, B 5210, XXB 365, B, 18783, B 5421, XXB 1500, B 19059, B 18262, B 5324, B 5334, B 5265, B 19760, 8727/447 and 5 without numbers), 5 workers in the Klebs Coll. (K 834, K 4449, K 936, K 5117, and X 21) and 2 workers (271 and one without a number) in the Berlin Museum. B 14192 in the Geolog. Inst. Koenigsberg Coll. contains 8 workers in a single block and another large block in the same collection (B 14342) contains 4 workers together with 2 specimens of a small *Colobopsis*-like *Camponotus*, several fragments of miscellaneous ants and débris of various kinds. This mass evidently represents a portion of the refuse heap, much like the kitchen-middens accumulated by our recent ants in or near their nests.

I believe that I am not mistaken in attributing the two male specimens (B 5421 and XXB 1500) to this species as they agree very closely with the male of the recent *Œ. smaragdina* Fabr. Mayr ob-

served the very close resemblance of the worker of *Œ. brischkei* to this recent species which is common in India, Polynesia and Australia and is known to use its larvæ in spinning the silken nest which is attached to the leaves and branches of trees. The worker of *smaragdina* differs from *brischkei* in having much longer and more slender legs and antennæ and a much more slender petiole with the node more angular and well behind the middle of the segment. The first funicular joint is nearly twice as long as the second, the frontal carinæ are more nearly parallel and the mesoëpinotal constriction of the thorax is longer and more pronounced.

Œcophylla brevinodis sp. nov.

Worker (Fig. 56). Length nearly 6 mm.

Differing from *Œ. brischkei* as follows: The body and appendages are much less slender, the mandibles shorter and more convex at the base, the eyes somewhat larger, the head broader and more deeply excised behind. The antennal scapes reach less than $^1/_3$ their length beyond the posterior corners of the head; funicular joints 1 and 2 are not more than 3 times as long as broad, the first a little longer than the second; terminal joints thicker, the penultimate joint as broad as

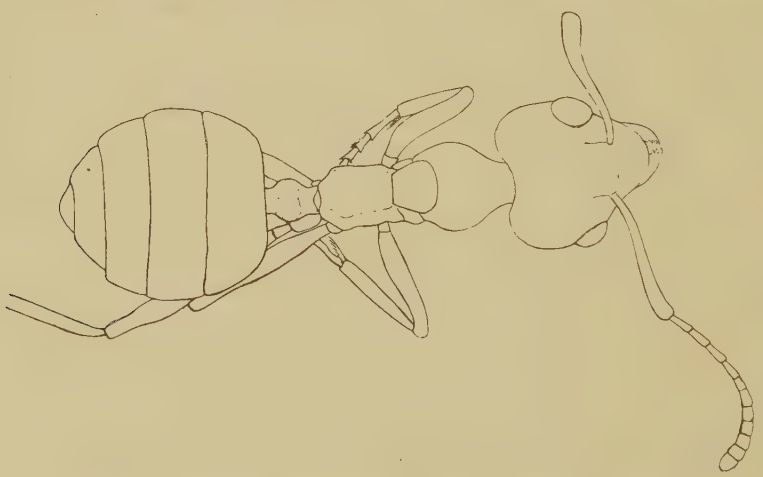

Fig. 56. *Œcophylla brevinodis* sp. nov. Worker. B 18730.

long. Thorax stouter, the pronotum as broad as long, the mesonotum but little longer than broad, the base of the epinotum long and not very convex. The petiole is as broad as long, with a low rounded node which has a faint, but distinct longitudinal impression in the middle. Gaster from above nearly circular, scarcely longer than broad,

with the anterior border feebly excised. Legs shorter and stouter than in *Œ. brischkei.*

The surface of the body is more opaque and seems to be more coarsely shagreened or coriaceous.

The erect hairs are short, extremely few in number and confined to the mandibles and tip of the gaster. There are traces of short sparse pubescence on the scapes, pronotum and gaster.

Color brown; legs slightly paler.

Described from a single specimen (B 18730) in the Geolog. Inst. Koenigsberg Coll. It is in a fair state of preservation and shows all parts of the body clearly. In the form of the thorax and petiole and the shorter appendages this species is much like a *Gesomyrmex* but the structure of the head and antennæ leave no doubt that it is a true *Œcophylla.*

Besides *Œ. brischkei* and *brevinodis* a third species of *Œcophylla* is known from the Sicilian amber, namely *Œ. sicula* Emery. This form closely approaches the recent *Œ. smaragdina* in having very long, thin legs and antennæ. The funiculi, however, have the first and second joints subequal as in the Baltic amber species. We may, therefore, arrange these four species in the following order, according to the increasing length of the legs, antennæ, petiole, mesoëpinotal constriction etc.: *brevinodis, brischkei, sicula* and *smaragdina,* the last being the most specialized, while *sicula* of the upper Miocene, is more recent geologically than the Baltic amber species and therefore most nearly related to the recent form. The occurence of three other species of *Œcophylla* in the Miocene shales of Europe (*Œ. obesa radobojana* Heer and an unnamed species at Radoboj in Croatia and *Oe. præclara* Förster at Brunstatt in Alsatia), though unfortunately known only from female specimens, shows that the genus was represented by many more forms during the Tertiary than at the present time. Mayr in his „Vorläufige Studien über die Radoboj-Formiciden" published in 1867 states that *Oe. obesa radobojana* cannot be distinguished from the recent *smaragdina,* but he does not regard these forms as identical.

Tribe Prenolepidini Forel.

Genus *Prenolepis* Mayr.

Prenolepis henschei Mayr. (Fig. 57.)

Prenolepis Henschei Mayr, Beitr. Naturk. Preuss. I, 1868, p. 34, Taf. I, Fig. 14—17, ♀♂.
P. henschei Dalla Torre, Catalog. Hymen. VII, 1893, p. 178; Ern. André, Bull. Soc. Zool. France, XX, 1895, p. 82, Handlirsch, Foss. Insekt. 1908, p. 860.

Mayr gave a very careful description of the worker and male of this ant. The worker is readily recognized by its pilosity which

resembles that of the worker, the hairs on the head, thorax and gaster being long, erect and coarse, and by the shape of the petiole, the node of which is inclined forward as in the worker. The male *P. henschei* can be distinguished by this latter character and the absence of the discal cell of the fore wing from the otherwise very similar male of *Lasius schiefferdeckeri*.

I believe that I have found the female of *P. henschei*. It measures 3,5 mm in length and has the coarse pilosity of the worker, although the hairs are shorter, especially on the gaster. The petiole is shaped like that of the worker and the wings, which have the same neuration as those of the male, are brownish, while the body is dark brown or black as in the females of many of the recent species.

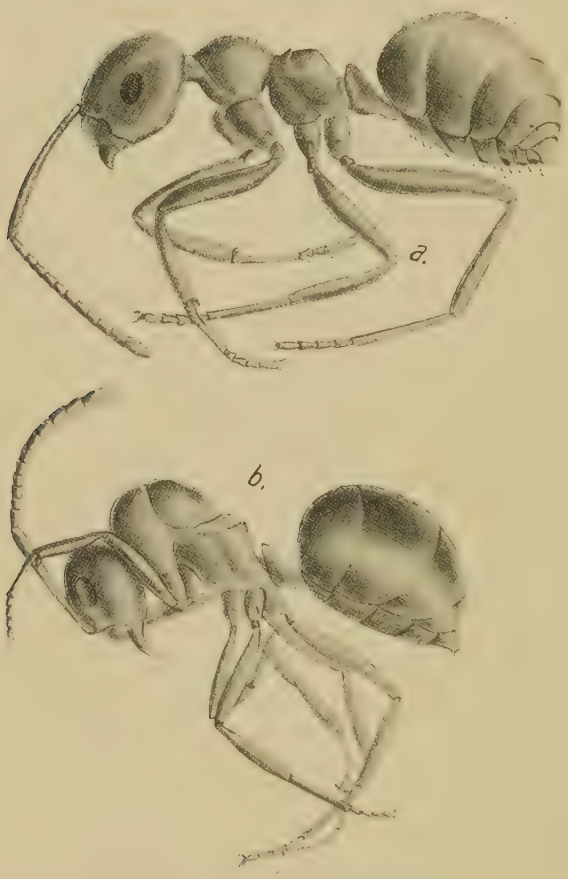

Fig. 57. *Prenolepis henschei* MAYR.
a) normal worker, K 2647; b) pseudogyne, K 868.

P. henschei is one of the commonest ants in the amber. MAYR examined 69 specimens, ERN. ANDRÉ 18. Besides 32 of the 36 specimens, including the single andro-type, recorded by MAYR as preserved in the Geolog. Inst. Koenigsberg Coll., I have examined 524 specimens. These are distributed as follows: 398 workers, 17 males, 10 females and one pseudogyne in the Geolog. Inst. Koenigsberg Coll. (XXB 38, B 18720, B 19338, B 18742, XXB 877, XXB 763, XXB 1351, B 18689, XXB 1082, B 19127, B 19392, B 18494, XXB 252, 10309/657, B 18643, XXB 1572, 10249/642, XXB 1455, XIIIB 904, XXB 5202 etc.), 71 workers, 6 males and one pseudogyne in the KLEBS Coll. (K 2653, K 2640, K 881, K 851, K 4043, K 2615, K 4247, K 922, α 1, K 872,

K 903, K 4198, K 877, K 4451, K 868 etc.), one worker in the Berlin Museum and 12 workers in the Haren Coll. (200, 221, 254, 749, 1842, 1075, 1736, 1875 etc.).

The two pseudogynes are interesting as showing that an anomaly which today occurs most commonly in species of the genus *Formica*, occasionally made its appearance as far back as Lower Oligocene times and in the genus *Prenolepis*. Emery has also described and figured a pseudogynic *Camponotus mengei* from the Baltic amber (*vide infra* p. 139). From analogy with the conditions in *Formica*, Wasmann would probably infer that the presence of pseudogynes in the amber *Prenolepis* and *Camponotus* is an indication that these ants were infested with beetle parasites similar in habits to *Lomechusa* and *Atemeles*, but Donisthorpe has recently communicated to me reasons for suspecting that the presence of pseudogynes even in *Formica* colonies, does not always necessarily imply the presence of these myrmecophiles. I have figured (Fig. 57b) the better preserved pseudogynic *P. henschei* which is in the Klebs Coll. (K 868). It measures only 2 mm and is therefore somewhat smaller than the normal worker, as is apt to be the case with *Formica* pseudogynes, and the curious hunched thorax, which is intermediate in structure between that of the worker and female, is precisely like that of the *Formica* pseudogyne. The specimen in the Geolog. Inst. Koenigsberg Coll. (B 5202) measures 2,5 mm. It is badly decomposed and not visible in profile. The pro- and mesonotum, however, as seen from above, are large and convex.

Mayr did not fail to notice the very close resemblance between *P. henschei* and the recent *P. nitens* of Southern Europe. This form is now regarded by Emery as being merely a subspecies of the North American *P. imparis* Say, which is, therefore, an ancient circumpolar species. Although *henschei* is smaller than either of these recent forms, there is a small variety of *imparis* (var. *minuta* Emery) in Maryland, which is not larger than the fossil species. It is not improbable, therefore, that *henschei* is the ancestor of the present *imparis*. This, I may state in passing, is always associated with arboreal vegetation and, in my experience, specifically with oaktrees, as one may easily observe in the pine-barrens of New Jersey and the live-oak groves and scrub-oak chaparral of California. It is probable that *henschei* lived in similar association with the oaks whose common presence in the amber forests is attested by the number of their peculiar stellate hairs scattered through the blocks enclosing the insects.

Prenolepis pygmæa MAYR.

Prenolepis pygmæa MAYR, Beitr. Naturk. Preuss. I, 1868, p. 36, Taf. I, Fig. 18 ♀♂; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 180; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908 p. 860.

The male and female of this species are known and I have been no more successful than MAYR in discovering the worker phase. The winged phases are easily distinguished from those of *P. henschei* by their smaller size, the shape of the petiole and the pilosity. The male measures only 1,5—1,7 mm, the female less than 3 mm. MAYR gives „*vix* 4 mm" for this phase, but the type in the Geolog. Inst. Koenigsberg Coll. is certainly smaller though its body is curled up and in an oblique position and therefore difficult to measure. The hairs on the body are much shorter than in *henschei*, especially on the legs and scapes, the petiole of the female is high and erect and compressed anteroposteriorly, and its rounded border is emarginate in the middle. In the male the petiole is somewhat inclined forward, but less than in *henschei* and has a straight, transverse and entire upper border.

I have seen 49 specimens of *P. pygmæa*; 33 males and 2 females in the Geolog. Inst. Koenigsberg Coll. (B 5080, XXB 4643, B 5100, XXB 713, XXB 1202, B 18598, XXB 282, 14375/1016, 11058/826, etc.), six males in the KLEBS Coll. (α 191, α 176, α 143, α 239) and 8 males in the Haren Coll. (473, 1452, 1875, 2429). In all of these collections single pieces of amber containing 2—4 males are rather common. In addition to these I have studied the single gynetype (10235/628) and 10 of the 11 androtypes cited by MAYR from the Phys.-Oec. Soc. Coll. (now the Geolog. Inst. Koenigsberg Coll.).

Tribe Formicini FOREL.

Genus *Lasius* MAYR.

Lasius schiefferdeckeri MAYR. (Fig. 58.)

Lasius schiefferdeckeri MAYR, Beitr. Naturk. Preuss. I, 1868, p. 44, Taf. I, Fig. 2, Taf. II, Fig. 27—32, ☿♀♂.

L. schiefferdeckeri DALLA TORRE, Catalog. Hymen. VII, 1893, p. 191; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908 p. 861.

All three phases of this ant were carefully described and figured by MAYR. Like *Iridomyrmex goepperti, I. geinitzi, Prenolepis henschei* and *Formica flori,* it is one of the most abundant ants of the amber. MAYR examined 174 specimens, ERN. ANDRÉ 96. I have seen 902 which are distributed as follows: 755 workers, 14 females and 13 males in the Geolog. Inst. Koenigsberg Coll. (B 19389, B 18839, XXB 348,

B 18728, XXB 790, B 8234, B 18448, XXB 1543, XXB 1358, B 18485, XXB 1238, B 18387, B 18237, XXB 1037, XXB 465, B 19504, XXB 465, XXB 799, B 19423, B 18904, XXB 37, B 18536, B 18684, B 19063, B 5117, B 993, etc.), 99 workers, one female and 2 males in the KLEBS Coll. (K 1082, K 1042, K 4260, K 2638, α 24, α 9, α 96, K 3706, α 118, K 819, K 5766, K 4240, K 4291, K 3711, α 154, etc.), 2 workers in the Brussels Museum (220 and 228), 2 workers in the Berlin Museum (260 and 262) and 9 workers and 5 males in the Haren Coll. (7, 441, 926, 927, 781, 1841, 1650, 1570, 1978, 2427, 2425, etc.). In addition to these I have also seen 76 of the 82 specimens mentioned by MAYR as preserved in the Phys.-Oec. Soc. Koenigsberg Coll. Of the female and male only single specimens were recorded by MAYR (629 and 630). I have not been able to find the former specimen in the material sent to me, as the slide numbered 10236/629 and labelled „*Lasius schiefferdeckeri* MAYR. ♀" bears a worker specimen instead.

I have seen both the larva and worker pupæ of *L. schiefferdeckeri*. The block B 5458 contains 2 workers and a larva and there are 3 blocks (B 78646 and 2 without numbers) each containing a worker pupa, enveloped in its cocoon, which is small and broadly elliptical like the cocoons of our recent *Lasii*.

MAYR called attention to the close resemblance of *L. schiefferdeckeri* to the recent *L. niger* L., which is represented in Europe, northern Asia and North America by a number of varieties (*niger* sens. str., *emarginatus, americanus, alienus, neoniger* etc.). The amber form is smaller in all three phases and less pilose than the typical *niger* and thus approaches the vars. *alienus* and *americanus* more closely, although the females of these forms are larger. MAYR is probably right in regarding the amber species as the ancestor of the existing *niger*, and the recent varieties as already foreshadowed in the fluctuation of the amber species, which varies considerably in size, pilosity

Fig. 58. *Lasius schiefferdeckeri* MAYR. Worker, bearing a parasitic mite on the left hind tibia. B 5345.

and coloration. The color variation, which ranges from black through brown and red to yellow, is probably largely due to preservation, but it is not impossible that several color varieties were already in existence in the Lower Oligocene.

That the species of *Lasius* of this age were already supporting myrmecophilous mites is shown by two workers in the Geolog. Inst. Koenigsberg Coll. (B 5345 and B 5187), each of which bears a large Gamasid attached to the ventral side of the base of the left hind tibiæ. The close similarity in the position of the two specimens suggests that these mites had already acquired the habit so remarkably developed in some of the recent species of *Antennophorus* and *Cillibano*, of attaching themselves to very definite regions of their host's body.

Lasius pumilus MAYR.

Lasius pumilus MAYR, Beitr. Naturk. Preuss. I, 1868, p. 46, Taf. II, Fig. 33 ♀; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 190; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 860.

Only the worker of this species was described by MAYR, and notwithstanding much search I have been unable to find the male and female in the material under observation. The worker is extremely small for a *Lasius*, measuring, according to MAYR, only 1.5 mm. Some of the specimens I have seen are even smaller (1.25 mm). The terminal joints of the maxillary palpi are long and subequal as in *L. schiefferdeckeri* and the recent *niger* and show no tendency to decrease in length distally as in the *flavus* and *umbratus* forms. The species can be readily distinguished from *schiefferdeckeri* not only by its size but by the pilosity and the much shorter antennal joints. Joints 2—4 of the funiculi are distinctly broader than long and the remaining joints, except the last, are scarcely longer than broad. The erect hairs are absent on the head, thorax and appendages and are present only on the gaster, and especially at its posterior end where they are long, sparse and delicate. The epinotum is shorter than in *schiefferdeckeri* and the petiole is rather high and obovate when seen from behind, with a rather sharp and, in some specimens, feebly emarginate superior border. The various specimens show the same range of actual color variations as *schiefferdeckeri*.

MAYR based *L. pumilus* on three specimens, one of which (7511/225) is still in the Geolog. Inst. Koenigsberg Coll. I have seen also 67 other specimens which I refer to this species, 58 in the Geolog. Inst. Koenigsberg Coll. (B 18891, XXB 754, B 18157, XXB 568, XXB 758, B 18941, XXB 724, B 5447, B 19708, B 603, B 18905, XXB 512, B 18784,

XXB 832, XXB 83, XXB 518 etc.) and 19 in the KLEBS Coll. (K 908, K 945, K 821, K 4784, K 4465 K 4054, K 818, K 5089, α 39, α 190, α 189, α 203, K 6430, α 202, α 184 etc.)

Lasius punctulatus MAYR.

Lasius punctulatus MAYR, Beitr. Naturk. Preuss. I, 1868, p. 46, Taf. II, Fig. 34, ♀; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 190; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 861.

This species is known only from the female, which, on superficial examination, as MAYR observed, would be regarded as the hitherto unknown female of *L. pumilus* on account of its size (3—3,8 mm), but for the fact that all the funicular joints are longer than broad. I have not seen the type specimen which MAYR cites as existing in the Geolog. Inst. Koenigsberg Coll., but 4 winged specimens in this collection (B 5098, B 19161 and 2 without numbers) and two winged and two deälated specimens in the KLEBS Coll. (K 5079, K 4046, K 927 and K 5083) agree perfectly in size and in the structure of the antennæ with MAYR's description. In all the winged individuals the discal cell of the fore wing is small.

Lasius nemorivagus, sp. nov.

Female (deälated). Length 6 mm.

Differing from the female of *L. schiefferdeckeri* in its larger head, which is broader than the thorax. The palpi are shaped like those of *L. schiefferdeckeri*, but the body is much more thickset, the legs and antennæ are much stouter, joints 2—6 of the funiculi are broader than long and joints 7—10 not longer than broad. The petiolar node is rather broad, anteroposteriorly compressed, with a blunt, entire superior border. In *L. schiefferdeckeri* this border is emarginate and sharper. The surface of the body is shining and finely punctate; the head, thorax, gaster and coxæ are beset with sparse, erect hairs. The color is dark brown, the appendages somewhat paler.

Described from a single specimen (without a number) in the Geolog. Inst. Koenigsberg Coll.

Except for the structure of the palpi, this female would be regarded as closely related to the recent *L. umbratus* NYL., which it very closely resembles in the shape of the head and body. It may, in fact, be the precursor of *L. umbratus*, which we must suppose to have arisen from just such a form, with the terminal joints of the maxillary palpi unabbreviated.

Lasius edentatus MAYR.

Lasius edentatus MAYR, Beitr. Naturk. Preuss. I, 1868, p. 46 ♂; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 183; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908. p. 861.

MAYR established this species on a single male specimen in the MENGE Coll. It differs from the male of *L. schiefferdeckeri* in having the apical border of the mandibles edentate and not marked off by a distinct angle from the basal border. I have found no specimens agreeing with this description, either in the Geolog. Inst. Koenigsberg Coll. or in the Klebs Coll.

Genus *Formica* L.

Formica flori MAYR.

Formica Flori MAYR, Beitr. Naturk. Preuss. I, 1868, p. 48, Taf. II, Fig. 35—37, ☿ ♀ ♂.

F. flori DALLA TORRE, Catalog. Hymen. VII, 1893, p. 196; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 863.

MAYR described all three phases of this ant, the worker and male from numerous inclusions, the female from a single poorly preserved and deälated specimen (3737/85) in the Geolog. Inst. Koenigsberg Coll. He noted the very close resemblance to the recent *F. fusca* L., with which he believed the amber form might, perhaps, prove to be identical. After the examination of a very long series of specimens of *F. flori*, including two good females, I can only confirm MAYR's statements. That it is the precursor or ancestor of *F. fusca* I believe admits of little doubt, but I am not willing to regard the two species as identical. The amber form varies much in size and to a considerable extent also in the shape of the thorax and petiole. Some specimens are much more slender than others. But all such variations may be found in a single colony of the existing *fusca* and cannot be used as a basis for the description of several species. One of the females, B 16592 in the Geolog. Inst. Koenigsberg Coll., is smaller than the gynetype, and both in this respect and in its pilosity and in having a more compressed petiolar node is much more like the female *F. fusca*. The wings are beautifully preserved and have a distinct brownish tint as in the existing var. *subsericea* SAY of North America. The other specimen of this sex, which bears no number, is unfortunately not before me as I write, having been previously returned to Koenigsberg with many of the worker specimens.

F. flori is one of the most abundant and conspicuous ants of the Baltic amber. MAYR saw 189 specimens, ERN. ANDRÉ 99. In

addition to 49 of the 53 specimens studied by Mayr in the Geolog. Inst. Koenigsberg Coll. including the single gynetype and two androtypes, I have examined 1022 specimens. These are distributed as follows: 731 workers, 2 females and 68 males in the Geolog. Inst. Koenigsberg Coll. (B 1898, B 19090, B 19425, B 19067, B 18779, B 19730, B 19194, B 18584, B 16592, B 18681, B 18834, XXB 1416, B 19026, B 14153, B 18737, B 18188, B 18335, B 5069 etc.), 118 workers and 18 males in the Klebs Coll. (K 4778, K 1690, K 4770, K 4459, α 73, α 110, K 4774, K 1052, α 107, K 875, α 135, K 4060, K 1056, K 768, α 4, α 49, K 1677, K 1062, K 5179 etc.); 39 workers and one male in the Berlin Museum (306, 280, 302, 301, 299, 297, 292, 291, 298, 290 etc.) 6 workers in the Brussels Museum (205, 207, 210, 226 and 2 without numbers) and 30 workers in the Haren Coll. (26, 220, 253, 373, 857, 855, 589, 442, 863, 927, 979, 983 etc.). There are also two worker cocoons (IIB 313 and B 5157) containing pupæ of this ant in the Geolog. Inst. Koenigsberg Coll.

Formica horrida, sp. nov.

Worker (Fig. 59). Length 3,5—4,5 mm.

Allied to *F. cinerea* Mayr. Head a little longer than broad, narrower in front than behind, with rounded sides and posterior corners and straight posterior border. Eyes large, moderately convex, Clypeus sharply carinate, its anterior border angulary projecting in the middle. Antennal scapes straight, not curved even at the base, of nearly uniform thickness except at their insertions, and extending about $^1/_3$ their length beyond the posterior corners of the head; funicular joints 2—10 subequal in length but the more distal joints broader. Thorax shaped much as *cinerea*. Petiole rather narrow, the node somewhat broader above than below, with straight sides and broadly rounded, rather sharp superior border.

Fig. 59. *Formica horrida* sp. nov. Worker.

Body shining, finely shagreened and superficially punctate.

Hairs erect, long, stiff, coarse and abundant, covering the body, legs and antennal scapes; longest on the gaster; on the funiculi very short and oblique. Pubescence on body very short and dilute.

Color black; venter and legs brown.

Described from two specimens imbedded in a single block (without a number) in the Geolog. Inst. Koenigsberg Coll. The same block contains also a fine worker of *Leptothorax gracilis* MAYR and several stellate oak hairs.

F. horrida differs from *flori* in its small size and peculiar pilosity. In these and other characters it is closely related to the recent *cinerea* of Europe, and in having erect hairs on the antennal scapes is even more like the Californian *pilicornis* EMERY, which is, in my opinion, merely a subspecies of *cinerea*. The eyes of *horrida* are naked, however, as in the typical *cinerea*, and not hairy as in *pilicornis*.

Formica phaëthusa, sp. nov.

Worker (Fig. 60). Length 10 mm.

Allied to *F. rufa* L. and differing from *F. flori* in its larger size, more robust stature, much shorter maxillary palpi, which reach back only to about the middle of the gula instead of to or slightly beyond the posterior border of the head, its more rounded and convex pro- and mesonotum, less angular epinotum and much broader and anteroposteriorly more compressed petiolar node, which has a convex anterior and flat or slightly concave posterior surface and a sharp, broadly rounded or straight and transverse superior border. The eyes are proportionally smaller and more nearly circular than in *flori*, the head is of much the same shape, being longer than broad, but the posterior border is less convex and nearly straight. The anterior border of the sharply carinate clypeus is entire, rounded and not projecting. The penultimate joints of the funiculi are a little shorter than in *flori*. The pilosity is very different, consisting of rather dense, long, delicate hairs covering the gaster, pronotum, dorsal surface of the head and coxæ. Possibly other portions of the trunk bore such hairs. There are no traces of erect hairs on the scapes or legs, except the row of bristles on

Fig. 60. *Formica phaethusa* sp. nov.
a) Worker, K 1678; b) head of same from below.

the flexor surfaces of the tibiæ and metatarsi and a number of short, stiff hairs at the tips of the femora and scapes. The body is coarsely shagreened and finely punctate and was probably opaque or subopaque in life, the mandibles are striatopunctate. The color is black as seen through silvery air-films.

Described from two specimens in the KLEBS Coll. (α 229 and K 1673). There can be no doubt that these represent a species quite distinct from *F. flori,* one which belongs to the *rufa* group and in its pilosity resembling the recent *truncicola* NYL. of Europe, except that the hairs on the body are much longer. Both specimens, and especially α 229, are somewhat decomposed and seem to have lost many of the hairs from the thorax. It must be remembered, however, that certain existing subspecies of *F. truncicola,* e. g. *sinensis* WHEELER of Central China and *integra* NYL. of North America, show a peculiar absence of the erect hairs on certain portions of the body.

Formica clymene, sp. nov.

Worker. Length about 9 mm.

Allied to *F. rufa.* Body more robust than in *flori* or even in *phaëthusa,* and the head differing in shape, having the posterior border broadly but distinctly excised, with more prominent posterior corners and somewhat flattened vertex, much as in large workers of the recent *rufa* and *sanguinea* forms. Clypeus, mandibles and palpi as in *phaëthusa*; antennæ shorter, the scapes stouter and extending less than $^1/_3$ their length beyond the posterior corners of the head; joints 1—3 of the funiculi slender, twice as long as broad, 4—6 a little longer than broad, the remaining joints, except the last, as broad as long. Eyes rather small and round. Thorax very robust, pro- and mesonotum together not longer than broad, convex and rounded above, the mesonotum circular. Mesoëpinotal constriction short and deep. Epinotum short and broad, with subequal base and declivity meeting at a blunt but distinct angle. Petiolar node broad and much compressed anteroposteriorly, with convex anterior and flattened posterior surface, its border very sharp, slightly produced and notched in the middle and abruptly turned backward with a small concavity on the anterior surface just in front of the border. Gaster large; legs robust.

Body and appendages densely shagreened, mandibles densely, head and base of gaster more sparsely punctate.

Erect hairs absent, except on the tip of the gaster, where they are short and coarse.

Color black.

Described from a single specimen (without a number) in the Geolog. Inst. Koenigsberg Coll. This specimen is well-preserved and shows the posterior portion of the head, antennæ, thorax and petiole very clearly. In the structure of these parts and in its pilosity it is evidently quite distinct from either *F. flori* or *phaëthusa*.

With the discovery in the Baltic amber of three new species of *Formica*, one allied to the recent *cinerea* and two belonging to the *rufa* group, WASMANN's recent speculations concerning the phylogeny of the genus are deprived of their last slender support and fall to the ground, because it can be no longer asserted that *F. flori*, which is very closely related to the recent *F. fusca*, is the oldest and most primitive species and that *F. rufa* and *sanguinea* are descended from such a form. Not only is it clear that *F. rufa* may be quite as old as *F. fusca* or even older, but it is even probable that *F. phaëthusa* and *clymene* were temporary social parasites on the much more abundant *F. flori* of the Oligocene, in precisely the same manner as the recent *F. truncicola* and *rufa* are temporary parasites on *F. fusca*. The six species of *Formica* now known from the Baltic amber not only show very clearly that the genus comprised a number of highly differentiated species as far back as the Lower Oligocene, but that even species of the *F. rufa* group, if they really originated in North America as EMERY and I have given reasons for supposing, must have migrated into Eurasia before early Tertiary times.

Formica constricta (MAYR). (Fig. 61.)

Camponotus constrictus MAYR, Beitr. Naturk. Preuss. I, 1868, p. 29, Taf. I, Fig. 11 ☿; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 226; ERN. ANDRÉ. Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 867.

Worker. Length 5—10 mm.

Body slender. Head longer than broad, convex above, a little broader behind than in front, without distinct posterior corners, with rounded posterior border and nearly straight sides. Eyes large elliptical, moderately convex, behind the middle of the head. Ocelli large and distinct. Mandibles with 7 unequal teeth as in many other species of the genus. Clypeus somewhat depressed, but strongly carinate, its anterior border produced, indistinctly sinuate in the middle and on each side. Clypeal and antennary foveæ confluent. Frontal area distinct, triangular. Frontal carinæ long, straight and parallel behind, somewhat sigmoidal in front. Antennæ inserted very near the posterior clypeal border, very long and slender; scapes straight at the base, not enlarged towards their tips, extending more than half their length

beyond the posterior border of the head; basal funicular joints slender, 3—4 times as long as broad. Maxillary palpi long. Thorax slender, shaped much as in the recent *F. pallidefulva* Latr., but the mesonotum straight in profile, anteriorly raised a little above the pronotum and sloping backward; epinotum short and convex, rounded, with indistinct base and declivity. Petiole fully as long as broad, its node rather small and narrow; as long as high, not compressed anteroposteriorly, very

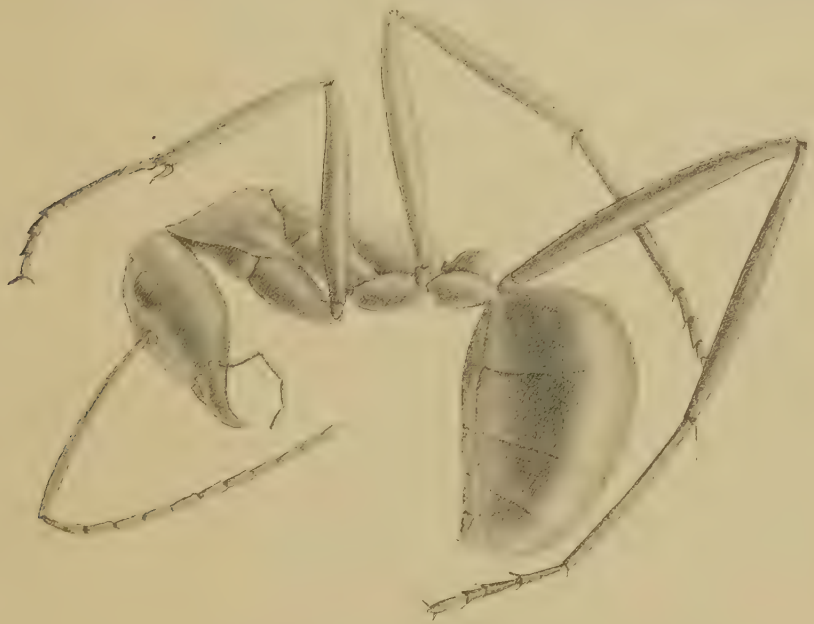

Fig. 61. *Formica constricta* Mayr. Worker. (Berlin Museum.)

blunt and conical, its anterior, lateral and posterior surfaces all convex without a distinct transverse superior border. Gaster rather large, elliptical. Legs very long and slender, especially the posterior pairs, with long spurs.

Surface shining, finely shagreened and sparsely and superficially punctate; mandibles rather coarsely striatopunctate.

Body, scapes and legs covered with short, bristly, erect hairs; flexor surfaces of tibiæ and metatarsi beset with a row of oblique bristles.

Color black or dark brown.

Mayr, I am convinced, was not only in error in assigning this species to the genus *Camponotus,* but probably included in his description of what he regarded as the worker major on account of a large and probably poorly preserved specimen of *Pseudolasius seltatus*, sp. nov. This I infer from his words: „Caput thorace latius, aut

permagnum et subcordiforme (in operariâ majori)". The extreme measurement which he gives of this phase (14 mm) is undoubtedly excessive. He examined 5 specimens, one in the Geolog. Inst. Koenigsberg Coll. (3719/67), which, though a very small specimen (6 mm), is to be regarded as the type, and one specimen each in the BERENDT, KLINSMANN, MENGE and MAYR Collections. Besides the type I have examined 12 specimens, distributed as follows: 9 in the Geolog. Inst. Koenigsberg Coll. (N 18831, B 5435, B 5348, B 5195, B 5520 and 4 without numbers), one in the Berlin Museum (without a number) one in the Brussels Museum (232) and one (K 5631) in the KLEBS Collection. Although these specimens vary considerably in size and are often in unfavorable positions or heavily coated with white films, a few of them nevertheless show the structure of the head very distinctly and enable me to assert that the species is a true *Formica*, allied to the North American *F. pallidefulva,* which it closely resembles especially in the structure of the head, antennæ, frontal carinæ, maxillary palpi and thorax, although it evidently represents an extinct and highly specialized offshoot of the probably Mesozoic, ancestral stem which gave rise to the *F. pallidifulva* group of *Formicæ* in the nearctic region. In the structure of the thorax and petiole the resemblance to *Cataglyphis bicolor* FABR. is even closer. It is barely possible that the smallest specimens, to which MAYR's type belongs, may differ specifically from the largest, as the joints of their antennal funiculi are proportionally shorter, but this cannot be decided without more and better preserved material.

Formica strangulata, sp. nov.

Worker (Fig. 62). Length about 7,5 mm.

Head large, excluding the mandibles about as broad as long, broader behind than in front, with feebly convex sides and nearly straight posterior border. Eyes rather large. Maxillary palpi long. Clypeus sharply carinate, with entire, broadly rounded anterior border. Frontal carinæ approximated in front and curved, straight and diverging behind. Antennal scapes curved at the base, slightly and gradually enlarged at the tip, reaching about $^1/_3$ their length beyond the posterior border of the head; basal funicular joints fully twice as long as broad, distal joints somewhat shorter. Thorax narrower than the head, dumb-bell shaped, deeply constricted in the meso-epinotal region, so that the dorsoventral diameter just in front of the epinotum is less than half that of the pro- or epinotum. Pronotum convex and evenly rounded above as is also the epinotum, which

has no differentiated base and declivity. Mesonotum from above nearly as broad as long. Petiolar scale as high as the epinotum, compressed anteroposteriorly, convex in front, flattened behind, with sharp, entire, broadly rounded superior border. Gaster rather large, elliptical. Legs stout.

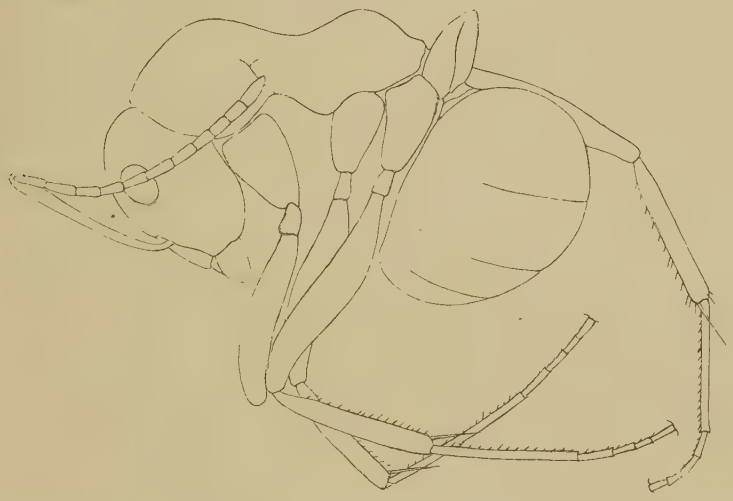

Fig. 62. *Formica strangulata* sp. nov. Worker. From the type in the Econ. Soc. Coll.

Surface apparently shining, finely shagreened and sparsely punctate.

Hairs erect, coarse, moderately long and abundant, especially on the gaster and thorax, sparser on the head and confined to the vertex, front and clypeus. Legs and antennal scapes without erect hairs; flexor surfaces of middle and hind tibiæ with rows of slanting bristles.

Color black.

Described from two specimens (without numbers) in the Geolog. Inst. Koenigsberg Coll. Both are much decomposed and partially covered with white films, but the form of the thorax is clearly seen to be very characteristic and unlike that of any other living or extinct species of *Formica,* owing to the peculiar mesoëpinotal strangulation, which is not unlike that of the worker *Prenolepis henschei* Mayr.

Glaphyromyrmex, gen. nov.

Worker. Allied to *Formica.* Body short and thickset. Head broadly elliptical, without posterior corners. Eyes very large, elliptical, flattened, nearly $^1/_3$ as long as the head and situated a little behind

its median transverse diameter. Ocelli present, small flattened. Mandibles rather small, triangular, with about 7 small, subequal teeth on the straight apical borders. Maxillary palpi rather long, 6-jointed; labial palpi short, 4-jointed. Clypeus rather large, ecarinate, its surface flush with that of the head and eyes, its anterior border entire, not projecting. Frontal area triangular; frontal groove distinct only in front, obsolete behind. Frontal carinæ very short and low, rather straight, rapidly diverging behind. Antennal insertions just behind the posterior border of the clypeus which does not project back between them. Antennal and clypeal foveæ very feebly developed, apparently confluent. Antennæ slender, 12-jointed; funicular joints all longer than broad, not incrassated nor forming a club towards the tip of the appendage. Thorax short, thickset, with distinct promesonotal and mesoëpinotal sutures and distinctly constricted at the latter, broadest through the pronotum which with the mesonotum forms a single hemispherical mass, and surrounds and encloses the semicircular mesonotum in front and on the sides. Epinotum smaller and lower, as broad as long, moderately convex, but without distinct base and declivity. Petiole surmounted by a low, blunt, transverse scale. Gaster rather large, elliptical. Legs rather stout, their tibiæ with simple claws, their middle and hind tibiæ with simple, non-pectinated spurs.

Glaphyromyrmex oligocenicus, sp. nov.

Worker (Fig. 63.) Length about 5 mm.

Head very regularly elliptical, a little longer than broad. Antennal scapes straight, scarcely thicker at the tips than at their bases, reaching a little beyond the posterior border of the head; joints 1—6 of the funiculi fully twice as long as broad; joints 8—10 only $1^1/_2$ times as long as broad. Petiole from above transversely elliptical, somewhat more than twice as broad as long; in profile the node is thick, low and rounded, with the posterior surface slightly flattened.

Body shining throughout, mandibles densely and finely striated, remainder of body beautifully shagreened, the thorax more sharply and finely than the head and gaster. Clypeus, cheeks and sides of pronotum with a few scattered punctures.

Hairs very sparse, erect, short and stiff, present only on the clypeus, tips of antennal scapes, vertex and gaster. Flexor surfaces

of middle and hind tibiæ with a graduated series of bristles. Pubescence very short and sparse, indistinct or absent, except on the antennal funiculi.

Deep red; body and portions of legs and antennae covered with a silver air-film.

Described from a single, well-preserved specimen, XXB 1542 in the Geolog. Inst. Koenigsberg Coll. This species will not fit into any of the known genera of *Camponotinæ*, though it is obviously very closely related to *Formica*. It has a peculiar habitus owing to the large flat eyes, elliptical head, with all the portions of its upper surface flush with one another, and the peculiar thickset thorax, with its large convex pronotum surrounding the semicircular mesonotum laterally and anteriorly.

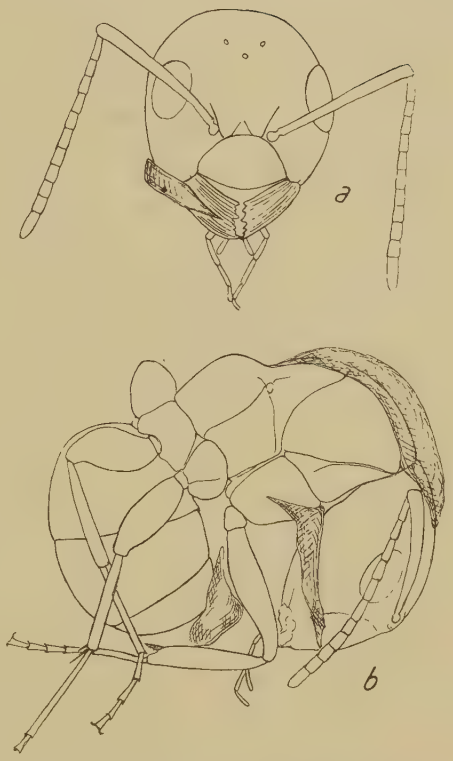

Fig. 63. *Glaphyromyrmex oligocenicus* sp. nov. Worker. a) head from above; b) body in profile. B 1542.

Genus ***Pseudolasius*** Emery.

Pseudolasius boreus, sp. nov.

Worker major (Fig. 64b.) Length about 5 mm.

Head large, nearly twice as broad as the thorax, subcordate, broader behind than in front and, excluding the mandibles, a little broader than long, with feebly excised posterior border, rounded and convex posterior corners and sides and convex dorsal surface. Eyes very small, elliptical, flat, well behind the median transverse diameter of the head and on its dorsal surface. Ocelli absent. Clypeus convex, carinate, its anterior border rounded and produced, narrowly sinuate in the middle, more broadly sinuate on each side. Palpi rather short and small. Clypeal and antennary foveæ distinctly confluent. Frontal area distinct, triangular. Mandibles convex, their apical borders not very oblique, with 7 unequal teeth. Antennæ rather slender; scapes curved at the base, reaching a little beyond the posterior corners of

the head; all the funicular joints longer than broad, gradually decreasing in length to the tip, except the last joint, which is as long as the two preceding together. Thorax hour-glass-shaped, deeply constricted in the mesoëpinotal region; broadest through the pronotum, which is convex and rounded above. Mesonotum rather small, elliptical, longer than broad, in profile rising a little above the pronotum in front and sloping backwards. Metathoracic spiracles prominent, closely approximated dorsally in the mesoëpinotal concavity. Epinotum with subequal base and declivity, both convex and meeting at a blunt but distinct angle. Petiole short, its node high, erect, anteroposteriorly compressed, higher than broad and somewhat broader above than below, with entire or feebly notched and broadly rounded superior border, which, seen in profile, is rather blunt, with convex anterior and flat posterior surface. Gaster large, elliptical, convex above, the base of the first segment truncated in front where it is applied to the posterior surface or the petiolar scale. Legs rather long and slender.

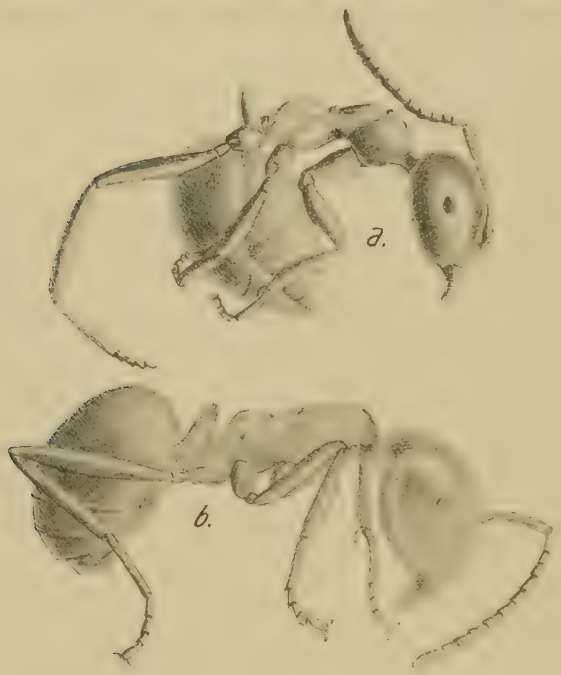

Fig. 64. *Pseudolasius boreus* sp. nov.
a) Minor Worker, B 19742; b) major worker, B 5619.

Body shining, sparsely and coarsely punctate; mandibles opaque, coarsely striatopunctate.

Whole body, including the scapes and legs, covered with numerous, erect, stiff, rather long and pointed hairs; antennal funiculi with shorter and more reclinate hairs.

Color light or dark resin-brown; black, in more decomposed specimens; the integument often peculiarly translucent.

Worker minor (Fig. 64a). Length 3—4,5 mm.

Differing from the major worker as follows: Head smaller, but little broader than the thorax, longer than broad, but little broader .

behind than in front, with straight posterior border and less convex sides. Ocelli present, minute. Antennal scapes reaching further beyond the posterior corners of the head. Mandibles 8-toothed. Pronotum and epinotum less convex, mesoepinotal constriction somewhat less pronounced. Sculpture and pilosity as in the worker major but color more often pale brown or yellowish.

Described from 33 specimens, distributed as follows: 9 major and 17 minor workers in the Geolog. Inst. Koenigsberg Coll. (XB 948, XXB 121, 11216 834, XXB 1085, B 18826, XXB 778, B 19212, B 18995, XXB 485. XXB 867, XXB 7177, B 19479, B 19712, 14374 1015, XXB 1022, B 19742 and 10 without numbers); 4 major and 2 minor workers in the KLEBS Coll. (K 6405, K 5619, K 1047, α 130, α 175, α 72) and one major worker in the HAREN Coll. (976).

Among the specimens included under the description of the worker minor, the head varies in size, so that the worker of this species is really polymorphic and not dimorphic. The small eyes and pale color would seem to indicate that it was nocturnal or crepuscular. It is very easily recognized among the amber *Camponotinæ* by its small eyes, peculiar pilosity and the shape of the thorax and petiole. I refer it to the genus *Pseudolasius* though in the structure of the thorax and the position of the eyes it differs greatly from the only species of this genus known to me, namely *Ps. binghami* EMERY of India. One of the recent species, however, *Ps. mayri* EMERY of Java, Sumatra and Borneo, has a deeply constricted thorax like *Ps. boreus*, judging from EMERY's description, but the apical mandibular border is very oblique. The eyes, which have only about 5 facets and must therefore be even more poorly developed than those of *boreus*, are placed a little in front of the middle of the head. In other respects the two species must be rather similar. It is apparent from EMERY's recent revision of *Pseudolasius* (Mem. Soc. Ent. Belg. LV, 1911, p. 219) that none of the 13 species which he enumerates is at all satisfactorily known. Of this number 12 are peculiar to the Indomalayan Region and only one to Africa. The occurrence of a species in the Baltic amber shows that the genus had a much wider distribution during early Tertiary times.

Tribe Camponotini FOREL.

Genus *Drymomyrmex*, gen. nov.

Female. Allied to *Aphomomyrmex* EMERY. Body rather long and narrow. Head subrectangular, decidedly longer than broad, as broad in front as behind, with straight sides and posterior border, with the moderately large, flattened eyes at the middle of its sides.

Ocelli at the corners of a moderately large triangle. Mandibles small, subrectangular, 5-toothed, the two apical teeth largest. Clypeus flattened, with entire anterior border, somewhat sinuate on each side. In profile the clypeus and mandibles form an obliquely truncated anterior surface to the head, somewhat as in certain species of *Colobopsis*. Maxillary palpi long, 6-jointed; labial palpi 4-jointed. Antennæ small and short, 11-jointed, the scapes not reaching to the posterior border of the head, funiculi enlarged towards their tips but without a differentiated club; all the joints except the first and last broader than long, last joint longer than the two preceding joints together. Frontal carinæ extremely short, nearly as far apart as the distance between each of them and the lateral border of the head, the clypeus not continued back between them but bounded behind by a straight transverse suture, very near which the antennæ are inserted. Frontal area distinct, triangular; frontal groove distinct but reaching only half way to the anterior ocellus. Thorax but little broader than the head, elliptical, with the mesonotum and scutellum flattened, and the epinotum long, depressed, sloping, without distinct base or declivity. Petiole thick, low and blunt. Gaster elongate elliptical, with parallel sides. Legs rather short and stout, with strong, simple spurs on the middle and hind tibiæ and well-developed simple claws and large empodia on the tarsi. Venation of wings as in *Œcophylla*, without a discal cell, with one cubital and a closed radial cell, but with proportionally larger stigma. Type *Drymomyrmex fuscipennis*, sp. nov.

Drymomyrmex fuscipennis, sp. nov.

Female (Fig. 65). Length about 7 mm; fore wing 6 mm.

Antennal scapes curved, gradually incrassated towards their tips which reach a little beyond the posterior orbits; first funicular joint as long as the two succeding joints together; joints 2—5 much, joints 6—9 slightly, broader than long.

Body shining, finely punctate and shagreened; cheeks and front also with coarse, scattered, elongate punctures; mandibles coarsely striatopunctate.

Upper surface of gaster, thorax and head together with the clypeus, mandibles, palpi and antennal scapes covered with numerous short erect or suberect hairs; legs with shorter, more appressed and less conspicuous, though equally dense, pilosity. The hairs on the front and clypeus are especially prominent as in certain species of *Camponotus* and *Colobopsis*.

Body black, legs in some specimens dark brown; wings uniformly smoky brown, with darker veins and stigma.

Described from four specimens in the Geolog. Inst. Koenigsberg Coll. (B 18862 (type), B 5126 and two without numbers). All of these specimens are more or less obscured by white films and bubbles and in none of them can the precise form of the petiole be determined. In every one of them the gaster is enclosed in a froth of minute

Fig. 65. *Dryomyrmex fuscipennis* sp. nov. Female.

bubbles and this condition, together with the uniform preservation of the specimens, indicates that they were probably all entrapped in the liquid amber at the same time and place and that they were all members of the same nuptial flight. One of the amber blocks contains a large number of the stellata hairs of oak-leaves.

At first I regarded this ant as a *Camponotus* of the subgenus *Colobopsis*, but the different structure of its antennæ, which are 11-jointed, and of the frontal carinæ, place it near *Aphomomyrmex*. It resembles *A. afer* Emery, but this species has 10-jointed antennæ in the female. As I have not been able to find the worker of the amber species, it has seemed best to regard the female, at least provisionally, as the type of a new but extinct genus intermediate between *Aphomo-*

myrmex and *Camponotus*. The structure of the head and body show that it lived in the cavities of twigs, in oak-galls or in abandoned insect galleries in solid wood, like the species of *Colobopsis*, many species of *Camponotus* s. str. and the Bornean *Aphomomyrmex hewitti* WHEELER.

Drymomyrmex claripennis, sp. nov.

Female. Length 6 mm.

Differing from the preceding species in its smaller size and in having the clypeus and mandibles more depressed and less truncate in profile, joints 2—9 of the funiculi somewhat longer in proportion to their width, the scapes longer and reaching nearly to the posterior border of the head, the eyes proportionally larger and more convex, the epinotum somewhat flatter and more sloping and the wings colorless, with paler veins and stigma. The petiole is clearly visible and in profile is longer than high, with a very blunt, low node, which has a short and rather abrupt, slightly convex anterior, a straight, sloping posterior surface. The sculpture and pilosity resemble those of *D. fuscipennis*, but the hairs are more slender and delicate, and more appressed on the legs. The color of the body, femora and scapes is black, that of the tibiæ, tarsi and funiculi dark brown.

Described from a single specimen (X 20) in the KLEBS Coll. This specimen has the gaster and much of one side of the head enveloped in a white film and the body is surrounded by a number of white bubbles and a few stellate oak hairs.

I suspect that MAYR's *Plagiolepis singularis*, which is described and figured from a single female specimen, may also belong to *Drymomyrmex*, but it cannot be referred to either of the species here described, because joints 2 and 7—9 of its funiculi are longer than broad, the petiole has a transverse node which is much higher than in either of my species and of a very different shape in profile, the epinotum is much less depressed and the hairs are sparser.

Genus ***Camponotus*** MAYR.

Camponotus mengei MAYR (Fig. 66.)

Camponotus Mengei MAYR, Beitr. Naturk. Preuss. I, 1868, p. 27 Taf. I. Fig. 1,8. ☿.
C. mengei DALLA TORRE, Catalog. Hymen. VII, 1893 p. 242; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908, p. 867.
C. sylvaticus var. *mengei* MAYR, Tijdschr. v. Ent. XXXIII, 1880, p. 23.
C. igneus MAYR, Beitr. Naturk. Preuss. I, 1868 p. 28, Taf. I, Fig. 9, 10, ☿; DALLA TORRE, Catalog. Hymen. VII, 1893, p. 235; ERN. ANDRÉ, Bull. Soc. Zool. France, XX, 1895, p. 82; HANDLIRSCH, Foss. Insekt. 1908 p. 867.
? *C. igneus* EMERY, Bull. Soc. Ent. France, 1905, p. 189, Fig. 2 (pseudogyne).

I believe that MAYR was mistaken in regarding *C. mengei* and *igneus* as distinct species. The only difference which he could detect between them was in the shape of the thorax, *C. mengei* having the dorsal surface convex in profile and passing over into the declivity of the epinotum without a distinct angle, whereas in *C. igneus* the thorax, from the anterior border of the mesonotum to the posterior end of the base of the epinotum forms a straight line, and the base and declivity of the epinotum meet at a distinct angle. These differences are clearly shown in MAYR's figures (Pl. I, Figs. 8 und 9). Now the examination of numerous specimens shows that these differences are somewhat exaggerated in MAYR's figures; that there is considerable variation in the convexity of the thorax, as indicated in my two figures (Figs. 66), and that the angle from which the specimen is seen may make the thorax look more convex than it really is. Moreover, an examination of MAYR's three types of *C. mengei* in the Geolog. Inst. Koenigsberg Coll. (209/29, 392/51 and 10234/627) shows that these actually have the thoracic outline of *C. igneus* (Fig. 9) and not of his Fig. 8 which represents *C. mengei*! Of the 103 specimens I have examined, all but two have the thoracic structure of *C. igneus*, while the two approach rather closely the outline of *C. mengei*. This outline is still more closely approximated in EMERY's figure of what he regarded as a pseudogyne of *C. igneus*, although he was not sure that it belonged to this species. Perhaps MAYR may have seen such a specimen and have drawn his figure from it. Although I have not

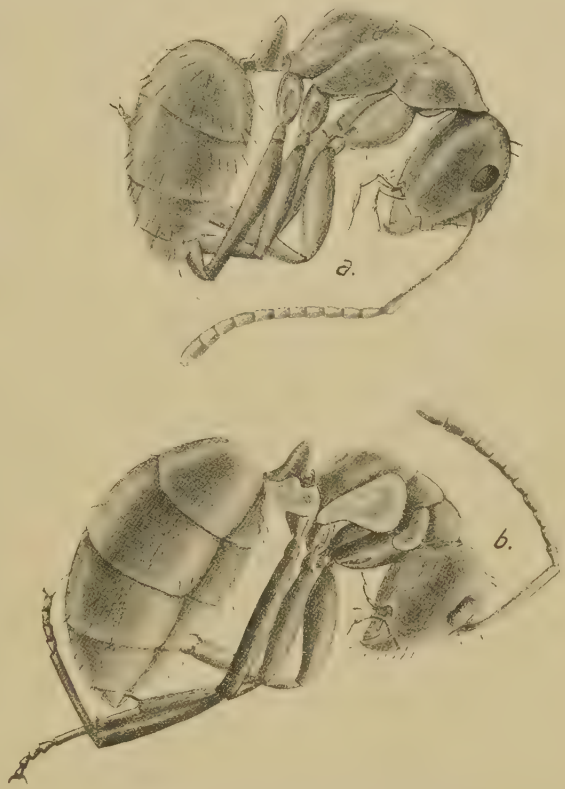

Fig. 66. *Camponotus mengei* MAYR.
a) Worker B 18996, with angular epinotum;
b) worker with more rounded epinotum.

seen the two types of *C. igneus*, which were in the MENGE Collection, I believe that my study of the types of *C. mengei*, together with the foregoing considerations, gives ample ground for regarding the two species as synonymous.

Of the species as thus defined to include also *C. igneus*, MAYR shaw 12 specimens, and the same number was seen by ERN. ANDRÉ. The 105 specimens which I have seen, are distributed as follows: 86 workers and 2 males in the Geolog. Inst. Koenigsberg Coll. (B 19756, XXB 201, B 19322, XXB 1592, B 5459, B 18996, B 11729, B 19673, IB 355, B 18373, B 5215, XXB 2098, XXB 1327, B 14149, B 5921, B 5204, B 19021, B 18376, B 11724, XXB 521, XXB 1686, B 1324, B 19088, XXB 1555 etc.), 16 workers in the KLEBS Coll. (K 5633, K 5585, K 4190, K 3547, α 68, K 1750, K 4172, α 127, α 26, K 2641, K 2621, K 3544, α 145, K 4195, K 765, K 5624) and one worker in the Berlin Museum (298).

The two specimens B 18651 and B 14935, which I regard as representing the hitherto undescribed male of *C. mengei*, are nearly 8 mm long, black, with ample yellowish wings, with brown stigma and paler veins. The pilosity is sparse, the hairs being short and visible only on the gaster. The body is slender and shaped like that of most recent species of *Camponotus*, the head narrower than the thorax, suborbicular with rather small eyes and ocelli and the mandibles edentate, though having a rather broad apical border. Clypeus carinate. Antennæ slender; maxillary palpi very long. Thorax robust, with convex mesonotum and scutellum; epinotum in profile with subequal base and declivity, the former sloping and slightly convex, the latter slightly concave. Petiole thick, low and transverse, with rather sharp superior border. Gaster long and slender, with small narrow genitalia, the stipites and volsellæ being shaped much as in the other species of the genus. Legs long, with the tarsal claws and empodia enlarged.

Although the workers I have seen vary considerably in the size of the body and especially of the head, they all have the aspect of mediæ and minors and I have seen no specimen with the head sufficiently large to merit the designation of major worker. One might infer from this fact that the workers of the amber *Camponotus* were less polymorphic than those of the recent allied species. Such an inference, however, would be premature, because the major workers in recent species are not only produced in much smaller numbers in the colonies than the mediæ and minors, but they are less inclined

to forage. We should expect, therefore, to find them very rarely or not at all in the inclusions.

Mayr was of the opinion that *C. mengei* is very nearly allied to the recent *C. maculatus sylvaticus* Olivier of Southern Europe, but the resemblance between these two forms does not strike me as being very close. The amber species does not have the habitus of the *maculatus* group in the shape of the head, which, in the largest workers I have seen, is subrectangular with feebly rounded sides and posterior border, and the clypeus is very feebly carinate and has a very short lobe with rounded corners. It also lacks the rows of graduated, oblique bristles on the flexor surfaces of the middle and hind tibiæ, a negative character which would, according to the present arrangement of the subspecies of *C. maculatus,* remove it from the *sylvaticus* group and ally it more closely with the subspecies *atlantis* Forel, *allii* Forel and *turkestanicus* Emery. But it can hardly be said to resemble these forms at all closely in other respects, and should, in my opinion, be regarded as a much more primitive and generalized species than *maculatus* sens. lat.

Addendum.

While the preceding pages were passing through the press, Mr. WILLIAM A. HAREN, of St. Louis, Mo., has sent me for study a small collection of amber inclusions containing the following ants:

Monomorium pilipes MAYR, one worker;
Iridomyrmex goepperti (MAYR), six workers and one female;
Iridomyrmex samlandicus WHEELER, one worker;
Asymphylomyrmex balticus WHEELER, seven workers;
Rhopalomyrmex pygmæus MAYR, one worker;
Gesomyrmex hoernesi MAYR, one worker;
Prenolepis henschei MAYR, six workers, one larva and three male pupæ;
Lasius schiefferdeckeri MAYR, one worker;
Lasius pusillus MAYR, three workers;
Formica flori MAYR, four workers;
Camponotus mengei MAYR, one worker.

The three male pupæ of *Prenolepis henschei* in this collection are *nude*, i. e. not enclosed in cocoons, a fact of considerable interest as showing that as far back as the early Tertiary the larvæ of this genus of *Camponotinæ* had lost the cocoon-spinning instinct which is still so rigidly preserved by most of the genera of the subfamily.